C-87101

BIBLIOGRAPHIES IN EDUCATION

No. 81

HEALTH AND SAFETY HAZARDS IN THE SCHOOL ENVIRONMENT

June 1987

CANADIAN TEACHERS' FEDERATION
110 ARGYLE AVE., OTTAWA, ONTARIO. K2P 1B4

ISBN 0-88989-196-6

92-00951/

Health and Safety Hazards in the School Environment

This bibliography lists materials on potential hazards to the physical health and safety of teachers and students in the school environment. The materials included should be of particular interest to members of school health and safety committees. Section one contains references of a general nature to health and safety in the workplace, both in and out of school, and occupational health and safety legislation. Section two groups more specific materials under appropriate subject headings.

The sources consulted in preparing this bibliography include: Canadian Centre for Occupational Health and Safety, Canadian Education Index (CEA), Current Index to Journals in Education (Oryx), Directory of Education Studies in Canada (CEA), Occupational Safety and Health (NIOSH), and Resources in Education (ERIC).

Material held in the CTF Library is marked with a single asterisk. The Library is also purchasing microfiche copies of the ERIC documents available. A double asterisk appears beside these titles, indicating the material is available on loan in microform only.

This bibliography was prepared in the George G. Croskery Memorial Library by Marita Moll.

Geraldine Gilliss
Director
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GENERAL

* 1. Abbey, D.S. Is the effect of environment on education overrated? School Administration, p16-18, May 1968.

The author laments the lack of basic research on the effects of school environment on education. Environmental factors are very high on the list of criteria by which schools are evaluated even though the effects of various environmental parameters on the teaching and learning process remain unknown. The interaction of various components of the environment such as physical, social and informational aspects requires a great deal more study.

2. Albrite, B.L. Tort liability: a special concern for teachers. Agricultural Education Magazine, v42 n7 p176, Jan. 1970.

Challenges teachers to investigate state laws and devote more effort to school safety.

* 3. American Academy of Family Physicians. Lifestyles/Personal Health Care in Different Occupations. Kansas City, Missouri: American Academy of Family Physicians, 1979. 127p.

This study was commissioned to determine how different occupational groups approach the question of health and how they vary as to lifestyle. The groups studied were business executives, family physicians, farmers, garment workers, secretaries and teachers. The report sets out to determine how these six groups differ with respect to work-related stress and home-related stress, what are the connections between stress and such aspects of lifestyle as smoking, drinking, exercise, etc., how do lifestyle patterns vary from group to group and what are the connections between stress and lifestyle, lifestyle and health.

4. Anderson, Rebecca Cogwell. Preventing health problems in pregnant workers. Personnel Administrator, v24 n11 p43-44, Nov. 1979.

Outlines several steps that can be taken to protect pregnant workers from work hazards.

* 5. Angus, Ronald M. Health and safety in the educational workplace. Crucible, v15 n4 p45-46, July-Aug. 1984.

This article discusses the implementation of the new regulation under the Occupational Health and Safety Act which includes teachers under the provisions of the Act for the first time.

* 6. Are these safety hazards in your classroom? Federation Update, v14 n4 p1-2, Oct. 27, 1986.

At presentations to various regional meetings, members of an Ontario Secondary School Teachers' Federation task force on occupational health and safety show that the average secondary school contains many potential health and safety hazards.

7. Ball, Roger, and Roy Smith. Design Criteria for the Control of Health Hazards in Schools. Edmonton: Alberta. Workers' Health, Safety and Compensation, Occupational Hygiene Branch, 1983.

This booklet identifies commonly found hazards in schools. Many specific guidelines are presented regarding ventilation, noise, illumination, and storage of volatile substances. Safety in woodworking shops, automotives, metal work shops, fine arts areas, music and band rooms, beauty culture rooms, duplicating rooms, photographic darkrooms, science labs, classrooms and changing rooms is discussed.

8. Basztyk, W.A. Caution Office Ahead: Enter at Your Own Risk. Toronto: CCH Canadian Ltd., 1987.

Written in a simple, straightforward manner, this book discusses potential hazards commonly found in an office environment. Second-hand smoke, quality of light, noise, stress, chemicals and equipment are some of the topics discussed. Some simple solutions are presented. Both Canadian and U.S. standards are discussed. Also included is a checklist on how to rate an office, a list of materials and equipment available, a film list, a list of associations and contact people, and selected case studies.

9. Befekadu, F. The effect of environmental strain upon students' comfort and work performance. Indoor Air, v5 p349-353, 1984.

Extensive investigations have been made in the past in order to provide a healthy and comfortable living and working indoor environment. This paper discusses the effect of thermal, visual and noise environments upon the health, comfort and work performance of students engaged in sedentary activity in the classroom. The investigation was carried out in two different buildings of different orientations and surroundings which offered varied environmental conditions. Suitable subjective criteria and corresponding scales expressing different subjective responses in terms of numerical values were used. Physical measurements on thermal, visual and noise environments were taken and simultaneous subjective assessment of 40 acclimatised subjects was made. Assessment results indicate a marked relationship between the physical measurements and the corresponding subjective assessment and also revealed that there were no marked interactions between the personal life of the subjects and the thermal, visual and noise environments.

10. Berthelot, Ronald J., and others. Safety and liability. Florida Vocational Journal, v8 n2 p1,6-14, Nov-Dec. 1982.

This series of five articles highlights Pensacola Junior College's occupational safety course, involving simulated emergencies, Florida's standards for teacher liability, electrical safety in the classroom and laboratory, color coding for machine safety, and Florida industrial arts safety instructional materials.

** 11. Blachly, P.H., H.T. Osterud, and R. Josslin. Suicide in professional groups. New England Journal of Medicine, v268 n23 p1278-1282, June 6, 1963. NIOSH-00043284.

All cases of suicide in Oregon from 1950 to 1961 were reviewed to determine whether the frequency is higher in some professional groups than in others. It was found that the suicide rate among physicians, dentists and attorneys was about three times that of white-collar workers, whereas the rate among teachers in elementary and secondary schools was lower than average. Factors that may contribute to this difference include increased emphasis on independent performance, more prolonged deferral of gratifications during the long period of training, the learning of violence, and preprofessional personality traits. Note is made of the marked difference in suicide rates among various states - a difference almost as great as that among foreign countries having the highest and lowest rates.

** 12. Black, Edwin. Anatomy of a prank. School Management, v16 n10 p34-35, Oct. 1972.

Lessons about safety that an administrator can learn from a fatal accident.

13. Boudreau, Allan. Popularity of carpeting on campus raises new questions of its fire hazard potential. College and University Business, v49 n2 p52-54, Aug. 1970.

As a result of a nursing home tragedy, new questions have been raised and new testing methods have been established to determine the safety versus flammability of carpeting.

* 14. Bumbarger, C.S. Educational space: its design and use. Canadian Administrator, v11 p13-16, Jan. 1972.

The effects of open area schools on the teaching-learning process are discussed. Noise, distractions and lack of privacy are among the negative aspects of this design.

15. Butchart, W.W. Fire regulations lack uniformity. Alberta School Trustee, v40 p10-12, Aug. 1970.

Proliferation of legislation, regulations and by-laws relating to fire safety has resulted in frustration and confusion among those responsible for the design of school buildings. The author recommends a single document which sets out design criteria for all school construction. The British example of a document consolidating all regulatory requirements relating to construction and fire safety is cited.

16. Campbell, Clifton P., and Joseph P. Buchanan. Fire in the shop. Industrial Education, v66 n7 p57-60, Oct. 1977.

Fire emergency preparedness measures to take to prevent school fires and to protect against injury and minimize damage when fire does occur are presented. Includes fire safety practices, extinguishers for different classes of fires and their use, and the need for fire safety training in schools.

17. Canada. Labour Canada. Occupational Safety and Health = Travail Canada. Sécurité et hygiène au travail. Establishment and Operation of Safety and Health Committees = Création et bonne marche d'un comité de sécurité et d'hygiene. Ottawa: Minister of Supply and Services = Ministre des approvionnements et services, 1974. 28/28p.

This booklet examines the factors to be considered in establishing an effective safety and health committee. These factors include the selection of safety committee members, the responsibilities of the members, the role and functions of the committee, and its procedures. = Passe en revue les facteurs dont il faut tenir compte lorsqu'on met sur pied un comite de

sécurité et d'hygiene. Ces facteurs comprennent la sélection des membres, la détermination des responsabilités, du rôle et des fonctions du comité ainsi que sa méthode de travail.

* 18. Canada. Labour Canada. Occupational Safety and Health. = Travail Canada. Sécurité et hygiène au travail. Planning for Safety. = Planification de programmes de sécurité. Ottawa: Minister of Supply and Services. = Ministre des approvisionnements et services, 1985. 40/40p.

This manual is intended to serve as a guide to persons who have been assigned the responsibility of developing and maintaining an accident prevention program. It may also serve as a standard with which to compare any existing programs. Basic factors such as policy, organization, inspection and statistics are discussed. = Le présent manuel est concu pour servir de guide aux personnes chargées de l'élaboration et de l'application d'un programme de prévention des accidents. Il pourra également servir de norme pour évaluer les programmes existants. Il traite avant tout de certains facteurs de base: politique à adopter, structure, inspection et statistiques.

* 19. Canada. Labour Canada. Occupational Safety and Health = Travail Canada. Sécurité et hygiène au travail. Safety Audit Guide = Guide de contrôle de la sécurité. Ottawa. Minister of Supply and Services = Ministre des Approvisionnements et Services, 1985. 14/14p.

This guide provides a framework upon which to develop a comprehensive assessment of accident prevention programs, environmental conditions and work methods in a working environment. = Ce guide se veut un cadre à partir duquel on peut effectuer une évaluation complète des programes de prévention des accidents, des conditions du milieu et des méthodes de travail.

20. Carson, Daniel H., and others. SER 2, Environmental Evaluations. SER, School Environments Research. New York: Educational Facilities Labs, Inc.; Ann Arbor: Michigan University, 1965. ED 018 149. Not available ERIC.

An environmental science already exists and is evaluated here in the second of a series of reports intended to be valuable to anyone interested in how environment affects learning and behaviour. Man is a nonstationary open system undergoing continuous interchange with his environment. This interaction, and several aspects of his environment -- spatial, thermal, luminous, sonic, and social -- are examined.

21. Caruba, Alan. How to control pests effectively. American School and University, v51 n9 p24,28-29, June 1979.

Effective structural pest control management is a team effort between the buildings and grounds staff and the pest control firm.

** 22. Chan, Tak Cheung. Physical Environment and Middle Grade Achievement. Greenville, S.C.: Greenville County School District, 1980. 16p. Available ERIC. ED 198 645.

This study measured the influence of air conditioning, carpeting, fluorescent lighting, and interior pastel coloring on the academic achievement of eighth grade Georgia pupils in 1975-76 when the variance due to socioeconomic status was statistically controlled. Analysis of covariance was used to compare the achievement scores of students on the Iowa Test of Basic Skills. Pupil achievement in air conditioned school buildings was consistently higher than pupil achievement in non-air conditioned school buildings. This consistent pattern did not exist between carpeted school buildings and noncarpeted school buildings, between school buildings with fluorescent lighting and school buildings without fluorescent lighting, and between school buildings with interior pastel coloring and school buildings without interior pastel coloring.

* 23. Chandler, L.T. Fire alarm system outdated. American School Board Journal, v149 n6 p32-33, Dec. 1964.

An efficient fire alarm system should -- (1) provide warning of fires that start in hidden or unoccupied locations, (2) indicate where the fire is, (3) give advance warning to faculty and administration so that panic and confusion can be avoided and orderly evacuation occur, (4) automaticaly notify city fire headquarters of the fire, (5) operate by both manual and automatic controls so that alarms will be sounded even when no one is present, (6) sound distinctive, unmistakable signals so there can be no doubt or confusion that this is a fire alarm, and (7) provide a means of conducting fire drills and evacuation procedures. The question is asked -- what kind of fire alarm system should a school have and how complex should it be. One answer is found in the standards on fire signaling systems issued by the National Fire Protection Association (NFPA). This nonprofit, technical and educational organization whose concern is the protection of life and property from fire, also carries out continuing programs of research and evaluates new materials and methods. The elements of a fire alarm system are also discussed. Every fire alarm system should have three basic elements -- (1) the alarm initiating device, (2) the alarm indicating devices, horns, bells, etc., and (3) the control unit which contains the equipment. Automatic detection systems which currently exist are discussed as well as the best use of these devices.

** 24. Colligan, M.J., and L.R. Murphy. Mass psychogenic illness in organization: an overview. Journal of Occupational Psychology, v52 n2 p77-90, June 1979. NIOSH-00092574.

Sixteen reports of organizational group psychogenic illness were reviewed. Seven cases involved work environments; nine occurred in school settings. In 15 of the 16 incidents, 93 percent of the affected groups were female. Research concerning personality characteristics of the affected individuals was inconclusive, but histories of absenteeism prior to the contagious outbreak were common. Psychosocial characteristics identified as potential precipitating conditions were: formally structured work or education settings involving well defined roles and regimentation; industrial jobs involving repetitive, perceptual motor tasks performed at fixed work stations with fixed production paces; unwanted overtime and pressure to increase production; physical stressors; poor relations between labor and management; and limited interpersonal communication among workers. The contagion of symptoms also is discussed in terms of the convergence/contagion dichotomy in collective behavior. The author suggests that the most effective way to end an epidemic episode may be careful debriefing of the workforce as to the nature and dynamics of contagious psychogenic illness.

25. Collins, Ruth Harvey. Planning for fire safety. Young Children, v32, n5, p29-32, July 1977.

Presents information on fire prevention, fire safety inspection and fire evacuation planning that child care directors and staff should be aware of.

* 26. Des comités de sécurité dans les écoles secondaires. Revue scolaire, v22 n8 p6, avril 1972.

L'auteur de cet article propose la création de comités de sécurité pour l'ensemble d'une école ou un laboratoire ou atelier. La deuxième formule permet à un plus grand nombre d'élèves d'en faire partie. Des comités du genre sont l'occasion toute trouvée pour fournir aux étudiants une éducation complète en matière de prévention et de sécurité. Ils apprennent en outre à s'exprimer, à travailler en équipe et à mettre en application les principes de santé préventive. On recommande de former des comités composés de cinq élèves dont un certain nombre se retirent à chaque mois selon un plan de rotation prévu à l'avance. Les membres du comité sont élus et se réunissent toutes les deux semaines pendant 30 a 45 minutes.

* 27. Commerce Clearing House. Canadian Employment Safety and Health Guide. Toronto: CCH, reporting services.

This guide consolidates all the significant legislation on health and safety, both federal and provincial, and provides authoritative editorial commentary. The unfolding case law interpreting the legislation is annotated. The law and the commentary is indexed in detail to permit easy retrieval of information on any topic reported. The whole is kept current by monthly updating. This guide is produced as an aid to those responsible for human resources and the quality of the workplace environment, including members of joint health and safety committees.

** 28. Connecticut State Dept. of Education. Safe School Guide. Hartford: Connecticut State Dept. of Education, Div. of Educational Administration, Nov. 1980. 125p. Available ERIC. ED 208 535.

This handbook is designed to assist persons who are concerned with preventing or minimizing property damage to schools through vandalism, arson, and theft, and with avoiding bodily injuries in and around school buildings. Many of the suggestions, while directed at the planning of new buildings, can be adapted to lessen the incidence of vandalism and injury in existing buildings. The guide treats six aspects of a total security system: the school site, including grounds, roads, parking lots, and play areas; the exteriors of buildings, including hidden spaces, doors, windows, locks, and lights; the interiors of buildings, including community areas, laboratories, shops, and classrooms; the location and protection of fire alarms, exits, trash containers, mirrors, and lockers; internal security, including alarm systems; and deterrent programs such as school watchers, security officers, and live-in or 24-hour custodial services.

** 29. Conners, Dennis A. The School's Macro and Micro Physical Environment: A Link to Understanding Stress. Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, March 19-23, 1982). 19p. Available ERIC. ED 219 842.

Defining stress as a "misfit" between individual needs and environmental attributes, this paper reviews research on areas where the designed environment, on both a schoolwide and a classroom level, interacts with the educational process. These interactions are considered from the perspective of stresses imposed on both teachers and students. The macro-environment of the school is examined in terms of its effect on the social interaction, wayfinding, and spatial orientation of users. The micro-environmental variables occurring in classrooms discussed include seating position, classroom design, density (number of students per unit of space), privacy, and noise, and their stress-producing impact on the classroom unit.

30. Conseil superieur de l'Education. Last appeal for a school fit to work in. Meqnews, n10 p14-15, Oct. 1976.

** 31. Cowles, Kathleen Letcher, and others. Safe Cockroach Control: A Guide to Setting Up an Integrated Pest Management Program within a School System. Napa, CA.: John Muir Inst. for Environmental Studies, Inc., Center for the Integration of Applied Sciences. 1983. 96p. Available ERIC. ED 238 697.

Integrated Pest Management (IPM) is a decision-making approach to pest control that has been used successfully on farms, city parks, offices, homes, and schools. IPM programs help individuals decide when treatments are necessary, where treatment would be most helpful, and what combinations of tactics would be most effective, safe, and inexpensive to adequately suppress the pests. The basic strategy of IPM involves modifying the environment so it is not capable of supporting a large pest population. This guide is designed for use by school system administrators in setting up an IPM program to control cockroaches throughout the school system. The program operates within the school hierarchy using four primary workgroups: pest control service operators; school principals; maintenance service personnel; and food service personnel. The first part of the guide, presenting the basics of a school IPM program, includes sections on: program initiation; five basic components of a cockroach control program; workshop composition/responsibilities; recordkeeping forms; and details of program components. The second part provides more detailed descriptions of the program's components and a brief discussion of basic cockroach biology and behavior. The final part describes elementary-level teaching packets available to school systems interested in including alternative pest management techniques in their curricula.

32. Davidson, Randall. Safety hazards in the physical plant. Secondary School Theatre Journal, v16 n2 p15-16, Winter 1977.

33. Day, C. William. The physical environment -- revisited. *CEFP Journal*, v18 n2 p4-6, Mar-Apr. 1980.

Reviews what is known about the effects on students of thermal, visual, and acoustical elements in classrooms.

34. *Designated Substances in the Workplace: a General Guide to the Regulations*. Toronto: Ontario Ministry of Labour, 1985.

* 35. Drew, Clifford J. Research on the psychological-behavioural effects of the physical environment. *Review of Educational Research*, v41 n5 p447-465, Dec. 1971.

The author investigates disparate bodies of literature and draws implications for the psychology of instruction and physical environment design.

* 36. Easson, I., and others. *Notification and Surveillance of Occupational Diseases in Canada and Other Countries*. Hamilton: Canadian Center for Occupational Health and Safety, 1984. 97p.

This report attempts to assess the current disease surveillance and notification systems in each provincial and territorial jurisdiction in Canada. Provincial and federal laws and regulations mentioning notification, surveillance or reporting in connection with disease (occupational and non-occupational) are examined in detail. Recommendations regarding the establishment of a national occupational disease notification system are presented. The report also includes a review of the occupational disease notification systems in Finland, the United Kingdom and the Soviet Union.

* 37. Easson, I., et autres. *Déclaration et contrôle des maladies professionnelles au Canada et dans d'autres pays*. Hamilton: Centre canadien d'hygiène et de sécurité au travail, 1984.

Dans ce rapport, on tente d'évaluer le système actuel de déclaration et de contrôle des maladies dans chaque province et chaque territoire au Canada. On présente en détails les lois et règlements provinciaux et fédéraux visant la déclaration, la surveillance ou les rapports qui concernent les maladies (professionelles ou autres). On fournit des recommandations quant à l'instauration d'un système national de déclaration des maladies professionnelles. Le rappport comprend également une revue des systèmes de déclaration des maladies professionnelles en vigueur en Finlande, au Royaume-Uni et en Union soviétique.

38. Easton, T.R. Safety precautions for secondary school. B.C. Science Teacher, v17 p13-14, Sept. 1975.

39. Eckholm, Erik P. The Picture of Health. Environmental Sources of Disease. Washington, D.C.: Worldwatch Inst., 1977. 256p. ED 148 749. Not available ERIC.

This book deals comprehensively with many of the environmental factors that endanger the attainment and maintenance of health, a condition defined as being a state of complete physical, mental, and social well-being. The author, taking a global view of community life and culture, environmental factors and economic realities, examines the influences of all of these elements on the health and well-being of various populations. The price of undernutrition and poor sanitation and the social policies that permit what amounts to a global scandal are discussed. He also examines the health toll of the affluent diet and life style and the changes that must occur if the specter of premature death is to be banished from the industrial world. Examinations of the environmental sources of cancer and the scope of occupationally induced diseases are far-reaching. This book should interest and assist government officials, medical and health practitioners, scientists involved in health issues, and laymen.

40. Electricity for schools and colleges. American School and University, v37 n5, Jan. 1965.

This special magazine issue contains a series of articles on the use of electricity in school and college buildings. Subject areas include -- (1) heating, (2) air conditioning, (3) automated controls, (4) lighting and its effects on learning, (5) lighting outdoor areas, (6) stage lighting, (7) power supply and electrical service, and (8) food service equipment. Descriptions of all-electric schools are emphasized, and several examples of such are given. Discussion in the different areas includes advantages and technical considerations, as well as criteria and examples of applications.

41. Faust, Russell W. An Investigation of Relationships Between Fifth Grade Students' Perception of the Physical Classroom Environment and Observed Environmental Factors. Ph.D. Dissertation, Columbia University, 1976. 247p. ED 140 469. Not Available ERIC.

An exploratory field study was conducted in 42 self-contained, elementary grade classrooms in 18 school buildings. Subjects were 1,030 fifth-grade students. The purpose of the study was to determine the range of physical environmental conditions in the classrooms; and how students' perceptions of the physical environment (1) describe the characteristics of the classrooms, (2) correlate with observed physical environmental conditions, and (3) correlate with students' general satisfaction with school. Physical environmental factors defined include thermal, visual, acoustical, spatial, and aesthetic variables. Every classroom was observed to have one or more unsatisfactory physical characteristic. Subjects' responses indicate that fifth-grade students demonstrate objective and discriminating perception of environmental factors. Students' perceptual responses support the observation that the focus of classroom design should be on qualitative rather than quantitative dimensions of the thermal and visual environment. The strength of students' responses also indicate paramount awareness of aesthetic, spatial, and acoustical stimuli -- those factors of the physical environment that have a psychological effect on the individual.

* 42. Federation of Women Teachers' Associations of Ontario. Teacher Health and Safety: A New Act to Follow. Toronto: FWTAO, 1985.

This booklet discusses the responsibilities of boards of education, teachers, and supervisors with respect to a new regulation under the Occupational Health and Safety Act which specifically includes teachers under the provisions of the Act. The operation of health and safety committees, the right to refuse unsafe work, powers of inspectors and sample collective bargaining clauses are also included. Health and safety concerns in the educational environment are listed.

* 43. Finchum, R.N. Design factors that can minimize school fire hazards. School Progress, v34 n3 p50+, March 1965.

Planning school buildings that are as fire safe as ingenuity can make them requires that attention be paid to their design, height, exit ways, area, corridors, stairways, basements, open courts, roof structures, vertical openings, hidden spaces and windows. Each of these areas are considered in turn.

** 44. Fredrickson, John H. Helping Principals Make Better Use of Existing Facilities. Paper presented at the Bicentennial Convention of the National Association of Elementary School Principals, Atlantic City, New Jersey, April 24-28, 1976. 16p. Available ERIC. ED 122 367.

The findings of two studies establish some deleterious effects of unsatisfactory physical environment on school children. However, modern technology enables the exercise of total environmental control in new and existing facilities. Between the realities of today and the expectations of tomorrow we have a transitional model -- the open plan concept. Principals must consider open space in terms of the potential manipulation of many subspaces, a manipulation dictated by innovative learning activities. Educational space should be able to change with the educational program and should involve: (1) differentiation of scale, (2) a sense of place, (3) a focal point, (4) differentiation of mood, (5) directionality, and (6) furnishings and equipment. Space modification effort also involves the control of acoustics and illumination.

** 45. French, John R., Jr., and others. Job Demands and Worker Health. Symposium. Paper presented at the 84th Annual Meeting of the American Psychological Association, Washington, D.C., Sept. 3-7, 1976. 44p. Available ERIC. ED 138 859.

Seventeen years ago a group of researchers at the University of Michigan became interested in the possibility that occupational health may be determined by psychological as well as physical hazards in the work environment. This symposium reports on current work in testing a unified theory of the effects of psychosocial stresses on mental and physical health. This document is divided into four sections: (1) Job Demands and Worker Health; (2) Occupational Differences in Job Demands and Strain; (3) Job Stress as Person-Environment Misfit and (4) Effects of Social Support on Occupational Stresses and Strains.

* 46. Fris, Joe. Health hazards in schools: is your school ripe for a negligence suit. Canadian School Executive, v1 n10 p15-16, Apr. 1982.

In Alberta, the Occupational Health and Safety division of the provincial government conducted numerous surveys of schools in the province and found that the requisite controls on potential hazards were frequently not in place. In a booklet called "Design Criteria for the Control of Health Hazards in Schools" hazards commonly found in schools are identified and specific guidelines for safety procedures are presented.

* 47. Gayfer, Margaret. Canadian Approaches to School Health Education and Services; Report of a CEA Survey. Toronto: Canadian Education Association, 1978. 64p.

In the course of a CEA survey, superintendents, principals and teachers were asked questions designed to evaluate and rate school health services according to uniform availability, particular needs and adequacy of financial support. The questionnaire gathered information on medical examinations, immunization programs, dental examinations, availability of doctors and nurses, nutrition programs, mental health services and other aspects of school health services. Recommendations for more effective delivery of school health services are included.

* 48. Gayfer, Margaret. L'enseignement et les services de l'hygiène dans les écoles au Canada, Rapport d'une enquête de l'ACE. Toronto: L'Association canadienne d'éducation, 1978. 74p.

Au cours de cette enquête menée par l'ACE, des surintendents, des directeurs d'école et des membres du personnel enseignant ont répondu à des questions conçues pour évaluer et coter les services de santé dans les écoles en fonction de la disponibilité générale, des besions particuliers et de la suffisance du financement. Le questionnaire a permis de réunir des informations sur les examens médicaux, les programmes de vaccination, les services de santé mentale et d'autres aspects des services de santé scolaire. L'étude renferme des recommandations visant une prestation plus efficace de ces services.

49. George, N.L., and Lonnie Gilliland, Sr. Question -- What Makes a School Site Safe. Answer -- Definite Planning. Chicago, Ill.: Association of School Business Officials, April 1966. 1p. ED 014 862. Not available ERIC.

Two staff members from a system of public schools, the Assistant Superintendent, and the Director of Safety Education, discussed the problems of traffic safety on and around the school site. Factors which were considered include: (1) school site and building location, (2) safety requirements, practices and principles, (3) sidewalk design and location, (4) parking and driveways, (5) fencing, and (6) parent education. Specific recommendations included: (1) locating the building on a corner of the site, (2) limiting access to two sides of the site, (3) regulating street parking and crosswalks, (4) separating pedestrian and vehicular traffic, (5) formulas for determining faculty and student parking needs, and (6) providing parents with the traffic plan. This document is available from the Association of School Business Officials of the United States and Canada, Chicago, Illinois.

** 50. Gingold, William. The Effects of Physical Environment on Children's Behavior in the Classroom. 1971. 197p. Available ERIC. ED 120 942.

No significant difference of student-concrete physical environment interaction occurred with a change in physical environment. A test was made on five null hypotheses related to the change of physical environment and (1) student-concrete physical environment interaction; (2) environmental preference by students; (3) student attending behavior; (4) student movement within the classroom; and (5) student-concrete physical environment interaction relationship to temperature, humidity, atmospheric pressure, sound level, and illumination level. All data recording and collecting procedures were made through classroom visitations and observations in classes that involved academic subjects. Subjects for the study consisted of 230 elementary and junior high age students located in three separate school facilities in Wisconsin. Forty of these subjects were educable mentally retarded children. All students had been in an "old" structure for at least a month before moving to a "new" structure. Other factors remained constant: classroom unit composition, curricula, teachers, and general time schedule.

51. Grade Students' Perception of the Physical Classroom Environment and Observed Environmental Factors. Ph.D. Dissertation, Columbia University. 1976. 247p. ED 140 469. Not available ERIC.

An exploratory field study was conducted in 42 self-contained, elementary grade classrooms in 18 school buildings. Subjects were 1,030 fifth-grade students. The purpose of the study was to determine the range of physical environmental conditions in the classrooms; and how students' perceptions of the physical environment (1) describe the characteristics of the classrooms, (2) correlate with observed physical environmental conditions, and (3) correlate with students' general satisfaction with school. Physical environmental factors defined include thermal, visual, acoustical, spatial, and aesthetic variables. Every classroom was observed to have one or more unsatisfactory physical characteristic. Subjects' responses indicate that fifth-grade students demonstrate objective and discriminating perception of environmental factors. Students' perceptual responses support the observation that the focus of classroom design should be on qualitative rather than quantitative dimensions of the thermal and visual environment. The strength of students' responses also indicate paramount awareness of aesthetic, spatial, and acoustical stimuli -- those factors of the physical environment that have a psychological effect on the individual.

52. Great Britain Dept. of Education and Science. Safety in Practical Departments: Handicraft, Art, Home Economics. -- London: H.M.S.O., 1973.

53. Green, Jack N., Ed. Fifteenth National Conference on Campus Safety. (University of Vermont, Burlington, June 21-26, 1968). Chicago, Ill.: National Safety Council, Campus Safety Association, Jun 1968. 67p. ED 030 286. Not available ERIC.

Presentations made at the fifteenth National Conference on Campus Safety. The following topics are dealt with -- (1) Occupational Health on Campus, (2) Teacher Liability in School Accidents, (3) Indoctrinating Students in Fire Safety, (4) Computer Installations Safety and Fire Protection, (5) The Design of Laboratory Buildings, (6) A Uniform System of Accident Reporting, (7) Safety in the Food Preparation Service, (8) A Respirator Program for Teaching and Research Facilities, and (9) Safe Handling of Compressed Gases.

** 54. Green, Jack N., Ed. Nineteenth National Conference on Campus Safety. (Brown University, Providence, Rhode Island, June 26-28, 1972). Safety Monographs for Schools and Colleges, No. 32. Providence, R.I.: Brown Univ.; Chicago, Ill.: National Safety Council, Campus Safety Association. 1972. 109p. Available ERIC. ED 124 100.

Most of this conference report is made up of papers presented on miscellaneous campus safety topics: two papers titled "Handicapped on Campus," by Charles Wingstrom and by Joseph F. Kuchta, Sal Mazzata, and Charles A. Cofield; "Radiation Hazards and Control" by Howard Browne; "Safety in the 70's" by Harold E. O'Shell; "OSHA (Occupational Safety and Health Administration) on Campus" by Jerry Dempsey; "Inside Fire" by Rexford Wilson; "Safety and the University Supervisor" by Leonard Marcus; "Faculty Liability" by Edward J. Regan; "Development and Operation of a Safety Program on the Small College Campus" by Leonard Vanderveld, Jr.; "Safety Review of Architectural Plans" by J.P. Eaker; and "Laboratory Safety" by Warren H. Munroe. Minutes of the annual meeting of the Campus Safety Association, the conference program, and lists of conference participants are also included.

** 55. Green, Jack N., Ed. Twenty-Second National Conference on Campus Safety. (University of Calgary, Alberta, Canada, July 1975). Safety Monographs for Schools and Colleges. Monograph No. 35. Chicago, Ill.: National Safety Council, Campus Safety Association, 1975. 112p. Available ERIC. ED 125 421.

The papers include discussions on: (1) training techniques for safety administrators; (2) materials and services from the National Safety Council; (3) fire safety measures; (4) high-rise buildings; (5) the role of the industrial hygienist in environmental health and safety; (6) chemical waste disposal facilities; (7) a chemistry department safety program; (8) safety programs of a federal agency on a university campus; (9) a situational approach to loss control; (10) portable combustible and toxic gas indicators and alarms; and (11) gas detection on campus.

** 56. Greene, Brenda Z. Protect Against Personal Injury to Limit Your Liability. Alexandria, Va.: National School Boards Assocation, 1985. 5p. Available ERIC. ED 256 075. Updating School Board Policies, v16 n5 p1-3, May 1985.

Accidents and injuries involving students, employees, or others using school facilities or equipment can result in lengthy and costly litigation. A proven way to reduce potential accidents and injuries is to work to eliminate the circumstances in which accidents occur. It is important to identify risks; the areas with the highest accident potential are: playgrounds, gymnasiums and athletic fields, industrial art shops, science laboratories, theater stage areas, and lunchrooms. School systems can protect against negligence charges by identifying risks and giving high priority to preventing injuries through established policies and regulations addressing accident prevention. Failure to supervise properly is the basis for most negligence suits. Providing proper supervision gives the school system a defensible position. Before students can participate in sports, a physical examination should be required. Regular inspections for hazardous conditions are essential. Established special emergency procedures with alternative backup plans are essential. There should be a process established for documenting all accidents and injuries. Board members should be notified of serious injuries. Periodic reports from legal counsel on legislation and court decisions that may influence local safety policies and procedures are also helpful.

* 57. Grossman, Michael. A worker's right-to-know about workplace chemicals = Le droit des travailleurs de connaître les produits chimiques auxquels ils sont exposés au travail. At the Centre = Au centre, v9 n4 p8-9, Sept. 1986.

Workers' right-to-know about chemicals used in their workplaces has become a prominent occupational health and safety concern in Canada, as it was in the United States a few years before. This paper surveys the present right-to-know situation in Canada, provincially and federally. It first enunciates the principles of a right-to-know from the perspective of workers and then measures the legal provisions in Canada for the right-to-know against those principles. = Après avoir soulevé l'intérêt de nos voisins du sud, la question du droit des travailleurs de savoir à quels produits chimiques ils sont exposés au travail est récemment devenue un sujet de premier plan dans le domaine de l'hygiène et la sécurité au travail au Canada. Cet article vise à faire le point sur l'état actuel de ce droit à l'échelle provinciale et fédérale au Canada. Nous énoncerons tout d'abord les principes de ce droit de savoir tel qu'il concerne les travailleurs, puis nous évaluerons les dispositions légales en vigueur au Canada en fonction de ces principes.

* 58. Groves, Cy. Building schools the wrong way. ATA Magazine, v62 n1 p8-10, Nov. 1981.

Practical and aesthetic features which, if incorporated in school design, would improve the physical and emotional health of teachers and students are discussed.

59. Guide de préparation de plans d'évacuation et de sauvetage dans les écoles. Québec: Ministère de l'Education, 1981. 89p.

60. A Guide for Joint Health and Safety Committees and Representatives in the Workplace. Toronto: Ontario Ministry of Labour, 1983.

61. Guidelines for Establishing Joint Health and Safety Committees in Ontario School Boards. Toronto: Ontario Association of School Business Officials, 1984. 5p.

** 62. Haessig, William B. Health and Safety Requirements for Existing School Buildings. Albany: New York State Education Department, Dec. 1967. 11p. Available ERIC. ED 019 831.

Health and safety considerations for existing school buildings have been developed, based on regulations of the state of New York. Main areas of consideration include -- (1) exits, (2) hardware, (3) stairways, (4) smoke and fire control, (5) heating and ventilating, (6) sanitary facilities, and (7) electrical equipment. Recommendations include material and equipment specifications and building dimensions.

63. Halton, David. Comment les matières chimiques du milieu de travail pénètrent dans l'organisme. Hamilton: Centre canadien d'hygiène et de sécurité au travail, 1986.

64. Halton, David M. Comment répondre aux questions concernant les produits chimiques dangereux: introduction aux ressources d'information sur la toxicologie professionnelle. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1986.

65. Halton, David M. How to Answer Questions About Hazardous Chemicals. Hamilton: Canadian Centre for Occupational Health and Safety, 1984. 21p.

66. Halton, David M. How Workplace Chemicals Enter the Body. Hamilton: Canadian Centre for Occupational Health and Safety, 1985.

67. Hanlon, Heather. A learning, working environment. Educational Horizons, v58 n2 p88-90, Winter 1979.

> The author describes physical conditions in the classroom -- light, sound, color and touch, and space -- that the educator can alter to improve human comfort and thus make the classroom a more pleasurable, effective place for both teacher and student.

** 68. Hay, Kenneth M., and others. Eye Protection in Kansas Schools. Topeka.: Kansas State Board for Vocational Education, Kansas State Dept. of Public Instruction, June 1967. 18p. Available ERIC. ED 025 118.

> A law passed by a state legislature requires that students in industrial arts shops and science laboratories must wear eye protective devices. Explanatory material presents the text of the bill and guidelines for implementation, including -- (1) types of eye hazards, (2) types of protective devices, (3) administrating eye safety equipment, (4) financing and manufacturers, and (5) recommended eye protection for specific subject areas such as industrial arts, science, art, and technical-vocational education. A synopsis of the United States of America Standards Institute safety code for goggles, spectacles, and lenses is also provided. Drawings of safety spectacle types and monogoggles are included.

69. Health and Safety Executive. Electrical Safety in Schools. London: HMSO, 1983. 4p.

70. Health and Safety in Educational Institutions: Selected References. Toronto: Ontario Ministry of Labour Library, 1980. 4p.

71. Health and Safety Manual for School Boards. Ottawa: Canadian Union of Public Employees, Health and Safety Department, 1981. 100p.

** 72. Health and Safety Resources for Child Care Workers. Berkeley, CA.: Child Care Employee Project, 1984. 62p. Available ERIC. ED 247 026.

Organized into three sections, these resource materials provide basic information for child caregivers about occupational hazards associated with child care work; personnel policies, staff burnout and environmental stressors; and employee rights. Contents of the first section include a general discussion of health and safety hazards in child care environments; a health and safety checklist; a fact sheet for women who clean child care centers; a discussion about art materials that should be avoided and alternatives to hazardous cleaning materials; guidelines for avoiding back injuries and preventing infectious diseases in child care centers; and discussions focusing on the eradication of infestations of head lice in children, control of cockroaches without the use of pesticides, asbestos in schools, and free and low cost health and safety resources. The second section provides discussions of staff burnout in child care settings, improvement of substitute policies, staff break time policy, health coverage, and personal safety for child care staff. Also provided is a discussion of possible environmental causes of stress on child caregivers. Materials in the third section deal with workers' compensation benefits, employment rights and wage and hour laws in California, and employment rights under the Fair Labor Standards Act.

73. Himes, Harold W. SER 1, Environmental Abstracts. SER, School Environments Research. New York: Educational Facilities Labs, Inc.; Ann Arbor: Michigan University, 1965. ED 018 148. Not available ERIC.

This collection of some 600 lengthy abstracts from the literature of environmental relationships is organized under headings that indicate the effect of environment on the human senses, and the effects of atmospheric, luminous, sonic, and social environments on behaviour. Equipment design, illumination systems and intensity standards are considered. It is hoped that this compilation will be a time-saving fund of interdisciplinary background data for those interested in the effects of the total environment upon the learning process.

** 74. Howze, Dorothy C., and others. Maternal and Child Health Issues and Female Labor Force Participation. Paper presented at the Conference on Changing Roles of Women in North Carolina, Raleigh, NC, May 9-10, 1983. Apr. 1983. 36p. Available ERIC. ED 259 819.

Reviewing health related "costs" of female labor force participation, this paper examines four highly salient maternal and child health issues. Discussion of acute illness in day care settings begins with an overview of studies on day care and illness and focuses on hepatitis A, appropriate sanitation, and indications of research on respiratory conditions. Policy recommendations for implementation at state, community, and center levels are offered. Subsequent discussion describes ways a woman's entry into the labor force can affect her family's nutrition and recommends that nutritional supports should be available to women working at home or in the labor force. Discussion of health insurance for mothers focuses on national and South Atlantic regional data indicating type of health insurance coverage for and number of plans held by mothers of varying marital and employment status. Recommendations illustrate two different approaches to providing better health insurance for mothers. Further discussion, concerning occupational health and the female labor force, begins with an overview and specifies two major issues confronting North Carolina policymakers. Recommendations considered proactive and maximally protective are offered. Additional analysis and discussion focuses on the protection of the workingwoman against occupational assaults on her health, reproductive system, and fetus. To select a policy that effectively addresses this problem, the concluding discussion rates five policy options across nine criteria. Examples of hazardous conditions in 13 predominantly female jobs are provided.

75. Hunt, Robert E. A campus is a total community. Journal of Environmental Health, v42 n3 p108-18, Nov.-Dec. 1979.

Described are the various components of the total college or university community and their associated environmental health and safety problems. Included are food service, insect and rodent control, multi-use athletic facilities, housing, laboratory animal facilities, laboratory biosafety, radiological health, fire protection, and emergency medical/disaster planning.

76. Hunt, Vilma R. The Health of Women at Work. A Bibliography. Occasional Papers No. 2. Evanston, Ill.: Northwestern University, Program on Women, Feb. 1977. 173p. ED 151 609. Not available ERIC.

Both English and foreign language articles and books, most of them published since 1950, are cited in this bibliography on the health of women in the workplace. Citations were selected to represent the efforts that have been made by health professionals, statisticians, historians, and social scientists in this area. The designation "at work" encompasses all work settings, including the home, but there are few references to the latter. The bibliography is divided into seventeen chapters, each of which has a brief author preface which notes issues and themes on the topic or refers the reader to related topics. Topics include history of working women; accidents; cardiovascular system; dermatitis and allergies; infectious diseases; effects of noise; radiation: ionizing and non-ionizing; reproductive systems (including pregnancy); respiratory systems; stress, disability, efficiency and absenteeism; effects of toxic substances; general studies of women; general epidemiological studies; occupational health services; United States government documents; International Labor Office documents; and documents for occupations not elsewhere classified in the bibliography. Each chapter is divided into English and foreign language studies. The bibliography does not cover mental health.

** 77. Institute of Transportation Engineers. Traffic Safety Planning on School Sites. A Technical Project. Lansing, Mich.: Institute of Transportation Engineers, Michigan Section, Jan. 1978. 42p. Available ERIC. ED 206 089. Microfiche only.

Control of traffic around school areas is one of the most important factors to be considered when selecting and designing a school site plan. To provide positive safeguards, it is necessary to establish and encourage school administrators to adopt a comprehensive set of guidelines. This booklet is directed to all personnel involved either in designing and operating new school facilities or in renovating and reconstructing existing ones. Topics considered include site selection, on-site safety, off-site safety, and safety on existing school sites. Figures present the minimum turning paths for passenger cars, single trucks, and school buses that should be used when designing curves and turnarounds on internal roadways. Another set of figures depict some "before" and "after" conditions, illustrating how existing school sites may be effectively and economically modified to adapt to changes in school bus zones, parent pick-up zones, parking facilities, pedestrian and bicycle routes, and playground areas. The appendix contains a list of Michigan officials and agencies that might serve as resources.

78. International Labour Office. Encyclopedia of Occupational Health and Safety (3rd edition). Geneva: ILO, 1985. 2 vol.

In this encyclopedia all the different aspects of occupational health and safety, including such specialised subjects as toxicology, industrial hygiene, accident prevention, occupational and social medicine and ergonomics, are covered in concise, comprehensive and clearly written articles by internationally known specialists. The accent is placed on practical information and on the safety precautions to be taken against the main hazards encountered in each branch of industry. Hazards discussed in the section on teaching include fire, accidents, respiratory diseases, nervous disorders, epidemic infections and venous congestion of the lower limbs.

* 79. International Labour Organization. Employment and Conditions of Work of Teachers. Geneva: ILO, 1981.

Considered by some experts as an occupational disease, stress has become the principal health and safety concern of teachers in most industrialised countries. This conclusion forms the basis for discussions and for the adoption of measures to tackle the pressing problems facing teachers.

* 80. Ison, Terence G. The Dimensions of Industrial Disease. Kingston, Ont.: Queen's University, Industrial Relations Centre, 1978. 24p.

This report shows how the organization of medical education, of labour relations and of claims adjudications, create in their combined effect a structure that tends to underestimate the dimensions of industrial disease.

* 81. Ison, Terence G. Occupational Health and Wildcat Strikes. Kingston, Ontario: Queen's University, Industrial Relations Center, 1979. 11p.

The difficulty of applying the legal machinery of grievance and arbitration procedures to issues of occupational health and safety is discussed. The scope of the employee's right to refuse work that is unsafe is considered from the management and union point of view. The author feels that the best way to approach this issue legislatively would be to define the right of refusal in broad terms; but accompany that with other measures to minimize the occasions on which the right would be needed.

** 82. Johnson, C.J., J. Moran, and R. Pekich. Carbon monoxide in school buses. American Journal of Public Health, v65 n12 p1327-1329, December 1975. NIOSH-00050632.

Following an incident in which 8 children became ill from carbon monoxide in a school bus, an investigation was made of carbon monoxide levels in school buses in the Seattle area. The procedure selected for the evaluation was to test a large number of buses at a nearby ski resort. As buses arrived, they were checked immediately to determine in-transit levels of carbon monoxide. Four buses tested had carbon monoxide levels in excess of Environmental Protection Agency maximum allowable concentrations for an 8-hour exposure. Two idling buses had nearly 3 times the concentration of carbon monoxide permitted by the EPA for a 1-hour exposure. A total of seven buses had concentrations of carbon monoxide not permitted by the EPA for more than a 1 hour period. Altogether there were 24 buses that had levels of carbon monoxide in excess of EPA standards for an 8 hour exposure. As a result of these determinations and other observations a number of recommendations were made to reduce the hazard of exposure to carbon monoxide in school buses.

** 83. Kansas State Dept. of Education. Safety Education Handbook. Volume 1. Topeka: Kansas State Dept. of Education, Wichita Public Schools, 1980. 472p. Available ERIC. ED 201 803.

This is the first of three volumes of a safety guide developed to assist Kansas administrators and teachers in organizing, evaluating, and maintaining safety programs. It provides information to help them identify, assess, and correct unsafe conditions relating to equipment and facilities and ensure a safe and healthy environment for themselves and students. The guide delineates areas to be considered in designing effective, ongoing safety awareness programs and provides technical information regarding the systematic development of those programs. Instruments for self-evaluation, reporting, and record keeping are included for assessment purposes. This volume addresses these topics: (1) program responsibility; (2) liability; (3) special education; (4) emergency action, medical first aid, and accident reporting; and (5) safety rules by curriculum areas. Curriculum areas covered include elementary education laboratory experiences; art education; home economics education; industrial education; language arts-drama; physical education, intramurals, and athletics; and science education.

** 84. Kansas State Dept. of Education. Safety Education Handbook. Volume 2. Topeka: Kansas State Dept. of Education, Wichita Public Schools, 1980. 671p. Available ERIC. ED 201 804.

This is the second of three volumes of a safety guide developed to assist Kansas administrators and teachers in organizing, evaluating, and maintaining safety programs. This volume addresses safety as regards equipment/major appliances of these types: (1) auditorium/staging equipment, (2) industrial equipment (machine guarding, automatic equipment, electricity/electronic equipment), (3) graphic arts equipment, (4) metalworking equipment, (5) plastics equipment, (6) welding equipment, (7) woodworking equipment, (8) physical education/athletic equipment, and (9) science equipment.

** 85. Kansas State Dept. of Education. Safety Education Handbook. Volume 3. Topeka: Kansas State Dept. of Education, Wichita Public Schools, 1980. 696p. Available ERIC. ED 201 805.

This is the third of three volumes of a safety guide developed to assist Kansas administrators and teachers in organizing, evaluating, and maintaining safety programs. This volume addresses these topics: (1) portable power equipment (small appliances, industrial portable power equipment), (2) hand-held tools and utensils (hand tools for elementary school use, hand-held tools and utensils for secondary school use, tools and utensils, scientific implements), (3) compressed air and compressed gas equipment, (4) personal protective equipment, (5) health and environmental control, (6) hazardous materials, (7) chemicals, (8) fire protection, and (9) school facilities. A bibliography and list of organizations that submitted materials for review are appended.

86. Koch, E.L. Quality of working life (QWL): some potential applications to education. Urban Education, v17 n2 p181-97, July 1982.

Describes the emergence of the Quality of Working Life (QWL) approach to work organization. Discusses the benefits that may be gained by implementing this approach in education, for example in the areas of labour management negotiations, stress management, and staff development.

** 87. Koppes, Wayne F., and others. Design Criteria for Learning Spaces. Seating - Lighting - Acoustics. Troy, N.Y.: Rensselaer Polytechnic Inst., School of Architecture, 1962. 52p. Available ERIC. ED 025 931.

The results of a project undertaken to assist the Office of

Facilities of the State University of New York in the development of design and planning criteria for "learning spaces" with particular emphasis on the considerations for seating, lighting and acoustics. The learning spaces referred to are classified as large group instructional facilities developed particularly for the utilization of aids and media in the learning process. Much of the work presented in this study is based on the Rensselaer Experimental Classroom Project. Topics discussed include (1) introduction - existing research general design considerations, and purpose of study, (2) the experimental classroom, (3) seating - introduction, evaluation, and suggested improvements, (4) lighting - general requirements, evaluation, and suggested improvements, (5) acoustics - introduction, general considerations, and critique, and (6) appendix.

* 88. Landsmann, Leanna. Is teaching hazardous to your health? Today's Education, v67 n2 p48-50, Apr.-May 1978.

Opinions from a survey of 9,000 teachers on teacher health are summarized. The role of the school principal in promoting teacher health is considered crucial.

** 89. Lasch, Henry A. A Study of Health Policies in Public School Administration. 1974. 11p. Available ERIC. ED 102 144.

This study was undertaken to identify, classify, and interpret extant written school health policies. Furthermore, it was planned to ascertain whether schools were using standardized forms or systematic procedures to formulate school health policies. Administrators in school districts representing every geographical area of the U.S. were asked to send any written material available in any area of school health. The greatest number of separate statements concerning health policies and procedures were identified under the following categories: health services, administrative responsibilities, first aid and emergency care, health of school personnel, environmental health, and communicable disease prevention and control. A considerably smaller number of policies were identified and classified under the areas of provisions for handicapped pupils; safety and accident prevention; qualifications, requirements and selection of health teachers; transportation policies; school lunch programs; and health instruction. The lack of definite policies and procedures in health instruction was considered particularly appalling. Health and a written statement of school health policies are of paramount importance to students, parents, teachers, and the community.

** 90. The Learning Environment. Salina, Kans.: Shaver and Co., 1968. 9p. Available ERIC. ED 021 434.

The learning environment is discussed in terms of environmental components or factors that should be considered by the architect. The design factors to be considered and elaborated on are as follows -- (1) program, (2) function, (3)light, (4) color, (5) acoustics, (6) temperature, (7) humidity, (8) spatial conformation, (9) structure, (10) site conditions, (11) reciprocative factors, (12) organismic factors, (13) flexibility, (14) aesthetics, and (15) budget. There must be a continuing quest for excellence in design of space to better serve the needs of students and teachers. The focus should be shifted from parts and pieces of buildings to the environment created by the space in buildings.

* 91. Littlefield, Angie. From health do us part. Forum. v11 n3 p30-32, Sept-Oct, 1985.

In April 1984, Ontario teachers gained coverage under the Occupational Health and Safety Act. Provisions of this act require that one central health and safety committee be established for each school board and that at least half the members of this committee be teachers who do not exercise managerial functions in schools. These committees have a legal responsibility to monitor programs and procedures, keep adequate records on accidents and health hazards, and receive, consider and dispose of health and safety related complaints from employees. In order to derive the maximum benefit from the new legislation, committee members and regular teachers must be aware of potential hazards. A number of hazardous substances are discussed -- asbestos, art materials, methanol used in duplicating machines, toxic chemicals, etc.

* 92. Mackiel, John. PMHT: Positive mental health for teachers. Clearing House, v52 n7 p307-310, March 1979.

After some of the work hazards unique to teaching are noted and the identifiable characteristics of the maladjusted teacher discussed, a three-stage teacher mental health plan is proposed to prevent children from being exposed to teachers who suffer from poor emotional health: prevention, assistance, dismissal.

** 93. Macleod, K.I.E. Occupational health services and environmental control in our schools. The Journal of School Health, v34 n5 p221-227, May 1964. NIOSH-00111663.

Potential health hazards prevalent in schools, through various exposures in school workshops, are discussed. Recommendations for control or prevention of these hazards are enumerated. Reasons for establishment of a school occupational health service are listed. The role of the school as employer is discussed. Administration by schools of pre-employment health examinations and periodic checkups are advocated. The guidelines of the Council on Industrial Health of the American Medical Association, for occupational health services are presented. The authors suggest that for an occupational health service to be effective it must work closely with the personnel department and have full administrative support.

94. Mansfield, Phyllis Kernoff. Women and work: women's occupational health education. Health Education, v13 n5 p5-8, Sept.-Oct., 1982.

The need for an occupational health education curriculum that informs women about job-related health hazards is discussed. Specific dangers of the workplace for women are pointed out, as is the need for reducing job-related stress.

** 95. McVey, G.F. Environment for Learning: The Application of Selected Research to Classroom Design and Utilization. Madison, Wisconsin: The University Book Store, 1969. 38p. Available ERIC. ED 030 292. Microfiche only.

Various factors of the classroom environment that can contribute to a more complete learning atmosphere are explored. The author presents a review of certain research findings that may serve as guidelines in the development of an environmentally coordinated classroom. The importance of providing a classroom which promotes a multisensory approach to instruction is suggested. Among those factors discussed are — (1) visual scanning, (2) the visual field, (3) color, (4) lighting, and (5) seating. Also included are separate sections concerning guidelines for the design of integrated acoustical and thermal environments. In conclusion it is urged that the schoolhouse should provide its occupants with stimuli which are diverse yet within permissible parameters of a coordinated classroom. Administrators, teachers, and in particular, designers, should acquaint themselves with the results of environmental research in order to produce this integration.

* 96. Neal, John W. Teachers and the Health and Safety Act: ramifications for boards of education. Ontario Education, v17 n1 p8-13, Jan-Feb 1985.

This speech, delivered to a school trustees convention, discusses the responsibilities of the school board in complying with the terms of the new Occupational Health and Safety Act which specifically includes teachers.

* 97. Negligence -- when is the principal liable? A Legal Memorandum, (NASSP) p1-6, Dec. 1980.

This memorandum discusses the particular responsibilities of principals with regard to the health and safety of students.

** 98. New York State Education Department. Manual of Planning Standards for School Buildings. Albany: New York State Education Department, and State University of New York, 1965. 158p. Available ERIC. ED 018 064.

This manual contains the requirements and recommendations for development and design in erection, repair, enlargement, and remodeling of school buildings, in terms of health, comfort, and safety of pupils attending the public schools. Specific areas covered by this manual include: structure and safety planning, materials, visual environment, mechanical planning, heating, ventilating and air conditioning, sanitary facilities, gas facilities, electrical work, and existing buildings. Appendices are given which include: a glossary, accepted standards, state laws, regent's rules and regulations, temporary classrooms, planning information, reference publications, a bibliography, and provisions for the physically handicapped. Tables include: door exit dimensions, limitations on plastics, thermal insulation materials, window requirements, brightness ratios, thermal environment, air quantities, fixture ratios, and minimum foot candle requirements.

* 99. Newell, R.C. Danger behind the school door. American Educator: The Professional Journal of the American Federation of Teachers, v3 n2 p8-11, Summer 1979.

Chemicals, asbestos, lead, and other substances used in classrooms, labs, art studios, and school lunchrooms pose risks to both students and teachers. Yet little is being done in a comprehensive manner to eliminate these risks.

*100. O.H.S. law: a school board's experience. Ontario Education, v16 n2 p26, Mar.-Apr. 1984.

One school board's experience with inspections by the Ontario Ministry of Labour under the Occupational Health and Safety Act are documented. The need for authorities to take into consideration the unique perspective of health and safety in an educational environment is stressed.

101. Ohlendorf, Pat. The day care syndrome. Maclean's, v97 n16 p60, Apr. 16, 1984.

**102. Oklahoma State Dept. of Education. Proceedings: Fourth Oklahoma School Plant Manager's Workshop. Oklahoma City: Oklahoma State Dept. of Education, April 1982. 52p. Available ERIC. ED 224 100.

Nineteen addresses given at the 1982 Oklahoma School Plant Manager's Workshop are presented in this document. The speakers focused on a number of specific issues, including designing safe school facilities, the roles of inspection agencies, school inspection programs, school evacuation plans, school and classroom safety, and the current status of legislation affecting school plant management.

103. Ontario Federation of Labour. Occupational Health and Safety: A Training Manual. Toronto: Copp Clark Pitman, 1982.

This manual offers a comprehensive information base, enabling workers to understand their working environment. It covers a wide range of toxic substances and pollution sources, detailing how they affect health. Also covered are stress, material handling, making machinery and equipment safe, principles of ventilation, personal protective equipment, and legislation in Ontario.

*104. Ontario has had little preparation for radioactivity scares. CT Reporter, v1 n5 p16-17, Jan. 1976.

216 children at St. Mary's school, Port Hope, were exposed to radioactive radon gas from landfill taken from a uranuim refinery.

**105. Ontario. Ministry of Education. Electrical Work in Schools. Toronto: Ontario. Ministry of Education, School Business and Finance Branch, 1973. 21p. Available ERIC. ED 095 638.

Most buildings rely on electricity for lighting, power, signals, and other communications. Electric energy is also used for heating and year-round thermal conditioning of spaces. Its ease of transmission, simple control and measurement, and relative safety make it a useful source of energy. This publication is intended to provide those persons responsible for the provision and operation of educational facilities with a general description of the present state of accepted electrical design for schools and to give some indication of future trends.

**106. Oregon State Dept. of Education. Health Services for the School-Age Child: Suggested Guidelines for School Districts. Salem: Oregon State Dept. of Education, 1981. 100p. Available ERIC. ED 205 298.

Organized around eight topics, this document provides guidelines for Oregon school district health services programs for students in preschool/kindergarten through grade twelve. A list of principles related to health program development, a summary of related health legislation, and a checklist for assessing compliance with Oregon administration rules are included, as well as suggestions for program development. Additionally, the teacher's role in health problem detection and referral is defined, and screening procedures for vision, hearing, height and weight, posture-scoliosis, teeth, and blood pressure are discussed. Subsequent sections cover communicable disease control and related responsibilities, emergency health care, and special health considerations (such as medication, child abuse, alcohol and drug abuse, pregnancy, suicide prevention, chronic health conditions, handicapping conditions, and health counseling). Finally, the topics of health records and health education are briefly discussed. Almost all of the sections of the document offer a checklist of statements for assessing the adequacy of school district health provision. Excerpts from legislation related to health care, guidelines for immunization, a communicative disorders program guide, growth charts, and screening forms are appended.

107. Orlans, F. Barbara. On 'caring' for classroom animals: the forum. Science Teacher, v46 n7 p30-31, Oct. 1979.

A rebuttle to the NSTA publication, "Safety in the Classroom" is given. Opinions of the author are substantiated by research and the references are included.

108. Ozaruk, Nick and Ronald Angus. Safety Program Basics: A Guide for Educational Facilities. Toronto: College, University and School Safety Council of Ontario, Workers' Compensation Board, Safety Education Division, 1985. 12p.

*109. Paiken, Carole. Cookies, air, antihistamines and their effects on children. Educational Courier, v48 n4 p18-22, Feb. 1978.

The author investigates growing claims that various learning and behaviour disorders are food, drug or chemical related.

**110. Pizzo, Peggy, and Susan S. Aronson. Concept Paper on Health and Safety Issues in Day Care. Final Manuscript. 1977. 241p. Available ERIC. ED 156 357. Microfiche only.

This report discusses the existence and prevention of major health and safety risks for children in day care and makes recommendations for the Federal Interagency Day Care Requirements (FIDCR) concerning health and safety. Section I describes varying concepts of risk related to probability and to possibility of adverse events, and discusses assumptions about risk made by insurance, legal and lay sources. Section II presents evidence which delineates the major risks to health and safety of young children, in terms of both frequency of incidence and potential severity of outcome. Risks discussed include motor vehicle and pedestrian accidents, fires and burns, falls, suffocation and ingestion, drowning, infectious disease, malnutrition, dental disease, lead absorption, hearing loss, developmental and speech disabilities, allergies, vision problems and genetically transmitted disease. Section III discusses four internal program characteristics and four outside resources which help prevent or minimize risks described in section II. Later sections survey current health and safety practices in day care, discuss three options for a federal role in minimizing risks, and offer recommendations pertaining to federal regulation and areas for further research.

111. Policies, Guidelines and Checklists for a School Safety Program. Ottawa: Canada Safety Council, 1984. 58p.

**112. Poysner, Larry R. An Examination of the Classroom Physical Environment. 1983. 47p. Available ERIC. ED 251 954.

The physical environment of the classroom is a web of interrelated and, in many instances, interdependent variables. To examine the effects of the physical environment of the classroom, a total of 45 annotated citations are grouped under the following categories: (1) importance and description of classroom environment; (2) individual factors of lighting and heating, color and noise, seating, and general variables; (3) impact upon students; (4) designing and planning for classroom environments; and (5) creative use of classroom environment.

**113. Reinhart, V. Bringing safety to school employees. Job Safety and Health, v3 n2 p11-13, Feb. 1975. NIOSH-00029104.

This article reviews the problem of bringing safety to school employees such as maintenance workers; air conditioning, plumbing, and heating technicians; roofers; and upholsterers. The hazard potential in a school is considered to increase by the variety of courses taught in the schools, such as chemistry lab, shop, driver education, and physical education. The need is stressed for a safety handbook for school jobs, with indications of safety sources. Details are given of the safety procedures followed in a particular school system.

114. Resnick, Jerome J. Educational Facilities Evaluation Guide. La Mirada, Calif.: Educational Planning Consultants, 1969. 82p. ED 037 945. Not available ERIC.

This school evaluation guide provides a means of recording and appraising the physical characteristics of existing educational plants. Each design factor of the physical environment is explained and recommendation values are assigned to them. This allows both school administrators and architects to graph the effectiveness of a particular environment. Profiles are included for site, spatial, visual, thermal, sonic, aesthetic, audiovisual, equipment, safety, maintenance, and educational factors.

**115. Resnick, Jerome J., and others. Guide for the Evaluation of School Facilities. Los Angeles: California Association of Public School Business Officials, Southern Section, April 1966. 62p. Available ERIC. ED 015 621.

The School Evaluation Guide is designed to provide workable criteria for appraisal of the physical characteristics of existing school plants. Information obtained from the guide can be used for the purpose of seeking out unsatisfactory building features and to stimulate improvements in future school construction. With this evaluation procedure, school administrators and architects can determine deficient characteristics in a school and the steps to be taken in correcting them. Section profiles have been included in the criteria for the site, spatial, visual, thermal, sonic, aesthetic, audio-visual, equipment, safety, and maintenance factors. Also included is a series of questionnaires to be submitted to groups of teachers, principals, students, and district administrators. These questionnaires supplement data gathered on sonic, thermal, and visual factors.

116. Roberts, Richard L., and Robert W. Merriam. Nationwide school survey shows regulatory need. Journal of Environmental Health, v39 n6 p416-417, May/June 1977.

Described are the results of a nationwide survey, conducted in 1975, to collect data concerning the extent of health authority involvement in checking school plans, inspecting construction, surveillance of school facilities; and the depth and scope of school environmental health and safety programs on a national basis.

*117. Robertson, Dilys. Ontario Health and Safety Guide. A Dictionary of Legal Compliance. Don Mills, Ont.: Richard De Boo.

This guide provides a practical and easy to access reference guide to health and safety related legal provisions in the Occupational Health and Safety Act and its regulations as well as to other related legislation. It is designed to enable users to relate health and safety issues to legal requirements rather than starting with the law and trying to relate legal provisions to the workplace. It provides concise overviews of legal requirements as well as references to the relevant legislation. Where various acts and regulations apply, they are brought together. Looseleaf format enables regular updating as legislative changes are made. This guide can be used as an educational and training resource as well as a guide to program administration.

118. Robinson, Joseph C. Can you be charged with negligence? Industrial Education, v71 n7 p22, Oct. 1982.

Ten questions regarding classroom and shop safety are presented for the teacher and school administrator to test themselves and guard against a ruling of negligence and legal liability in the performance of their jobs.

*119. Sack, Jeffrey, and Ethan Poskanzer. Contract Clauses; Collective Agreement Language in Canada. (Second edition). Toronto: Lancaster House, 1985. 474p.

Chapter 33 of this extensive work on contract clauses discusses specific legislative provisions in each province with regard to the right to refuse unsafe work and the composition and operation of health and safety commitees. Sample clauses which give added powers and functions to health and safety committees and provide added protection against specific hazards (e.g. VDT's, air and noise pollution, etc.) are provided.

120. Safety film with a new slant now available for schools. Canadian Occupational Safety. v8 n1 p23+, Jan. 1970.

121. Safety in our schools. Industrial Safety, v26 n2 p31, Feb. 1980.

122. Safety training in educational establishments. British Journal of Occupational Safety, v7 n83 p373, Spr. 1968.

*123. School fire safety program. Education Office Gazette, v19 p17-18, Jan. 1970.

This article presents information and a specific set of instructions for supervisors and principals with regard to the school fire prevention program of the Province of Nova Scotia.

124. School Program: Information and Reference. Toronto: Industrial Accident Prevention Association, c. 1984. Kit.

**125. Schwartz, Rosalind M., Ed. New Developments in Occupational Stress. Proceedings of a Conference. Los Angeles, Calif.: Los Angeles Institute of Industrial Relations, Dec. 1980. 73p. Available ERIC. ED 201 822.

This volume contains the proceedings of a conference held to acquaint managers and health care professionals with new developments in the field of occupational stress. Psychological stress research performed by the National Institute for Occupational Safety and Health (NIOSH) from 1971 to 1976 is reviewed first, with an emphasis on defining high-risk work groups and isolating specific sources of stress in the work environment which may influence worker health. Other presentations include an examination of the relationships between coronary heart disease and machine-pacing with occupational stress; a discussion of the rise of worker compensation claims based on cumulative injury, which includes stress-related diseases; discussions of issues bearing upon the establishment of work-based programs to deal more effectively with occupational stress/strain, including the necessary steps to be taken by a consultant in setting up a corporate stress awareness program; and a description of an active, in-house employee assistance program amenable to including stress management. Both a socio-technical approach to dealing with stress in large organizations and a union-management collaborative program on occupational health are described. Finally, specific topics which merit attention are outlined in the concluding remarks.

*126. La sécurité dans les ateliers et les laboratoires. Revue scolaire, v22 n8 p8-11, avril 1972.

Cet article s'adresse aux administrateurs scolaires, aux directeurs et même au personnel enseignant. Il fournit des conseils judicieux sur les normes de sécurité à observer en matière d'espace, d'éclairage, de ventilation et de services personnels (dans les ateliers et les laboratoires). Il fournit une liste de questions facilitant un choix judicieux de machinerie et d'outils manuels. On y trouve des recommandations au sujet de l'emplacement de l'équipment, de la prévention des risques particuliers, de la facilite d'accès et de circulation.

127. La sécurité dans les écoles. Hebdo-éducation, n4 p174, 17 nov. 1967.

*128. La sécurité publique dans les écoles: préoccupation éducative. Revue scolaire, v22 n8 p3-5, avril 1972.

La Fédération des commissions scolaires catholiques au Québec passe en revue divers aspects de la sécurité publique. Elle a mené une enquête statistique auprès de vingt pour cent de l'effectif scolaire en 1970-71. On y signale que la majorité des accidents se produisent dans les écoles secondaire et que le lieu privilégié semble être le gymnase, suivi de près par les cours d'école et les ateliers. On propose divers moyens d'éviter les accidents, notamment le respect des règlements qui régissent la sécurité des batiments; il est également souhaitable d'enseigner aux élèves des règles et des méthodes qui leur permettent d'acquérir une réelle expérience de la sécurité.

**129. Settles, Mimi. Safety in the Preschool. Baie d'Urfe, Quebec: Parent Cooperative Preschools International, 1972. 7p. Available ERIC. ED 069 395.

Guidelines for safety in the cooperative preschool are outlined, emphasizing control of the physical environment to insure maximum freedom for the children compatible with maximum safety. Building standards are set for stairways, rooms, lavatories, parking lots, harmful supplies, and wading pools. Orientation for safety is discussed in regard to health, car pool rules, animals, mother assistant assignments, fire protection, civil defense, emergency cards, and emergency phone numbers. Daily school safety is stressed for children's clothing, transportation and arrival, use of both indoor and outdoor equipment, and various special events and field trips.

**130. Singel, Raymond J. Planning the Learning Environment. Madison, Wis.: Madison Public Schools, Jan. 1969. 29p. Available ERIC. ED 037 946.

The problems and hazards of present learning environments are reviewed in conjunction with environmental control and its influence on school plant quality. Environmental criteria are included for the effects of the thermal, acoustic, and luminous environments on the learning process. Classroom space and flexible utilization are also discussed with regard to efficient and effective learning. Bibliographic citations are included.

*131. Smith, Murray. Living at work. Manitoba Teacher, v60 n2 p6, October 1981.

Although schools are not generally recognized as hazardous workplaces, closer examination reveals many potential dangers. Combined efforts of staff, students, administrators and trustees are necessary to help workplace health and safety committees determine hazardous situations and pursue remedies.

132. Stellman, Jeanne M. The hidden health toll: a cost of work to the American woman. Civil Rights Digest, v10 n1 p32-41, Fall 1977.

Large numbers of women work at jobs that present serious health hazards, although most people associate workplace hazards with traditionally "male" jobs. Physical dangers, stress, and fatigue lead to manifold health problems among working women. These problems should be investigated and conditions improved for workers of both sexes.

133. Students at risk. Occupational Health, p246-247, July 1972.

*134. Swinton, Katherine E. "Enforcement of occupational health and safety legislation: the role of the internal responsibility system", in Swan, Kenneth P., and Katherine E. Swinton (eds.) Studies in Labour Law. Toronto: Butterworths, 1983. p.143-176.

Recent amendments to occupational health and safety legislation have emphasized the importance of the "internal responsibility system" as a primary method for enforcement. In this study, Professor Swinton discusses the three major components of this system found in the Ontario Occupational Health and Safety Act: the right to participate in joint labour-management health and safety committees, the right to know about workplace hazards, and the right to refuse dangerous work. As the legislation provides only minimum standards, she concludes that there is an ongoing need for collective bargaining to supplement the standards, along with government initiatives to monitor and regulate health hazards.

*135. Teachers included: Occupational Health and Safety Act. The Teacher, v24 n9 p1, Jan. 29, 1986.

After many years of being exempted from health and safety legislation, Nova Scotia teachers are now covered by the recently proclaimed Occupational Health and Safety Act. Implementation of provisions of the Act are discussed.

**136. Texas Education Agency. Guidelines for Theatre Safety. Austin: Texas Education Agency, Div. of Curriculum Development, Dec. 1982. 28p. Available ERIC. ED 226 396.

Prepared to help school administrators and theatre arts teachers establish and maintain safe environment for the actors, technicians, and audience members who participate in educational theatre programs, this guide is divided into two major sections. The first section presents administrative guidelines covering recommended procedures, teacher responsibilities, theatre accessibility, field trips, and facilities and equipment. The second section, recommended for duplication and distribution to students, covers theatre safety, including general regulations, clothing and personal protective equipment, fire protection, ladders, tools and machinery, rigging, lighting, paint, silk screen painting, and makeup. An appendix lists titles available from the Center for Occupational Hazards.

*137. Thomas, Keith. Security and safety in the small school. Manitoba Rural School Review, v1 n1 p12-14, Fall 1984.

The author discusses security and fire alarm systems for small schools using equipment that is simpler and less expensive than systems designed to serve large institutions. A self inspection form for small schools is included.

138. U.S. Bureau of Radiological Health. Radiation Sources in Secondary Schools. Report of a Limited Survey. Rockville, Md.: U.S. Bureau of Radiological Health, 1969.

**139. United States Department of Labor. Eye Protection in School Shops and Labs Safety Standards. U.S. Department of Labor, Bureau of Labor Standards, Feb. 1965. 4p. NIOSH-00059348.

The need for protecting the eyes of student workers in school shops and laboratories through goggles and other equipment is reviewed with reference to existing legislation which requires such protection for all school students. The National Society for the Prevention of Blindness states that at least one-half of all blindness could have been prevented. Topics discussed include cost of safety eyewear, kinds of goggles, and requirements of the American Standard safety code for head, eye and respiratory protection.

**140. Wakefield, Howard E. Safety Factors in Educational Facilities. An Annotated Reference List. Madison: Wisconsin Univ., ERIC Clearinghouse on Educational Facilities, Nov. 1968. 31p. Available ERIC. ED 025 142.

Abstracts and descriptor terms are presented for 26 selected references with safety orientation. Included in addition to several general planning handbooks are topics related to -- (1) stairways, (2) air structures, (3) site planning, (4) lighting, (5) bidding practice, (6) physically handicapped, (7) laboratory design, (8) mobile classrooms, (9) fallout protection, and (10) fire protection.

*141. Weinstein, Carol S. The physical environment of the school: a review of the research. Review of Educational Research, v49 n4 p577-610, Fall 1979.

Research on the impact of classroom environment on student behavior, attitudes, and achievement is reviewed. The review is divided into three areas: environmental variables; ecological perspectives; and open space school designs. Research needs are discussed, and the advantages and disadvantages of various research designs are summarized.

**142. Whitebook, Marcy, and Gerri Ginsburg. Making the "Child Safe" Environment "Adult Safe": Occupational Health and Safety Concerns for Child Care Programs. 1983. 15p. Available ERIC. ED 239 761.

Results of a nonrandom nationwide survey of 89 child care workers in 20 states concerning work-related health and safety conditions confirm that similar hazardous conditions exist in child care programs throughout the nation. Results also confirm that concern and anger about such conditions and their potential consequences are widespread among staff, as is the need for appropriate training and resource materials to deal with such hazards. The study uncovered a startling prevalence of hazards originally thought to be of little immediate concern, such as the on-site use of chemicals and pesticides. In addition to identifying major hazards in the work environment, respondents were also asked for data on current organizational policy affecting on-site conditions. In general, findings show evidence of working conditions that contribute to the physical and professional debilitation of child care staff and are consistent with previous study results suggesting that child care may adversely affect workers' health. Also included in this report are a brief discussion of a model for improving center conditions and a list of resources providing information on occupational health and safety topics.

**143. Wilson, Charles C., ed. School Health Services. Washington, D.C.: National Education Association, 1964. 425p. Available ERIC. ED 082 069. Microfiche only.

A comprehensive guide for health procedures in small and large school systems, this volume emphasizes the need for coordination of school efforts with those of parents, departments of health, private practitioners of medicine and dentistry, and community health agencies. Particular attention is given to the role of the teacher in school health services. This reference volume focuses on the school health services aspect of school health education, the procedures carried out by physicians, nurses, dentists, teachers, and others to appraise, protect, and promote the health of students and school personnel. Such procedures are designed (1) to ascertain the health status of pupils and school personnel; (2) to counsel pupils, teachers, parents, and others to arrange needed treatment or school programs; (3) to help prevent communicable diseases; (4) to provide emergency care for injury or sudden illness; (5) to promote optimum sanitary conditions and to provide proper sanitary facilities; and (6) to protect and promote the health of school personnel.

**144. Wilson, Charles C., and Elizabeth Avery Wilson, ed. Healthful School Environment. Washington, D.C.: National Education Association, 1969. 298p. Available ERIC. ED 032 727. Microfiche only.

This publication deals with the development, maintenance, and full utilization of a healthful school environment, encompassing such areas as (1) school organizations which affect the student environment, (2) accident prevention, (3) the criteria for healthful food services, (4) physical education and the necessary athletic facilities, (5) full utilization of health education resources, and (6) the effect teachers have on the emotional tone of a classroom. The more physical aspects of school environments and how they may affect physical and mental health are also discussed. These include proper site selection, building design, lighting, acoustics, ventilation, and utilities.

145. Woods, G.H. Lead in schools. New Scientist, p105, July 12, 1973.

146. Wuorinen, Val. A Beginner's Guide to Accident Investigation. Hamilton: Canadian Centre for Occupational Health and Safety, 1984. 14p.

147. Wuorinen, Val. Checklist and Guidelines for Joint Occupational Health and Safety Committees: Organizational Factors. Hamilton: Canadian Centre for Occupational Health and Safety, 1984.

148. Wuorinen, Val. Enquêter sur les accidents de travail: un guide de base. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1984.

149. Wuorinen, Val. Liste de contrôle et lignes directrices pour les comités mixtes d'hygiène et de sécurité professionnelles: les questions d'organisation. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1984.

**150. Acoustics and Educational Facilities. *A Guide for Planners and Administrators*. Troy, N.Y.: Rensselaer Polytechnic Inst., Center for Architectural Research, Dec. 1966. 129p. Available ERIC. ED 022 336.

An attempt to gather and organize information regarding acoustics in schools, and a planning guide for school architects and administrators, this report can be useful at various stages in school design, particularly analysis, planning and construction. To accomplish these goals two attitudes are necessary -- (1) acoustics must be thought of as more than "removal of noise," and (2) the concept of acoustics as an "after the fact" curative for sound problems should be replaced by inclusion of acoustical considerations at every level of architectural design. Guidelines are oriented to provide the designer with (1) an understanding of basic acoustical principles, (2) the ability to perform basic analytic measurements, and (3) an insight to identify acoustical problems which demand a greater degree of technical skill. Chapters include (1) basic principles, (2) acoustics and architectural programming, (3) acoustics in school planning, (4) acoustics and facilities design, and (5) acoustics and noise control. The information is thoroughly illustrated, supported by a bibliography, and followed by a checklist for planners and administrators.

151. Apfel, Robert E. Resounding facts on hearing loss. Science Teacher, v44 n8 p31-34, Nov. 1977.

Provides a brief description of the physiology of the human ear. The effect of sustained noise levels on hearing loss is discussed, as well as the establishment of maximum noise levels for American industries.

**152. Bass, Alan M. Acoustical Environments. Educational Facilities Review Series Number 16. Eugene: Oregon Univ., ERIC Clearinghouse on Educational Management, April 1973. 8p. Available ERIC. ED 074 586.

This review surveys documents and journal articles previously announced in RIE and CIJE that deal with the principles and techniques of sound transmission and control, particularly as they relate to school environments. School planners and administrators are advised that excessive acoustical insulation costs may be avoided by early decisions pertaining to site selection, arrangement of school buildings, and grouping of areas within the school. Nine of the documents surveyed are available from the ERIC Document Reproduction Service.

153. Breysse, Peter A. School noise. School Health Review, v3 n4 p16-18, July-Aug. 1972.

154. Bronzaft, Arline L., and Dennis P. McCarthy. The effect of elevated train noise on reading ability. Environment and Behavior, v7 n4 p517-527, Dec. 1975.

This study investigated the hypothesis that low reading achievement may be related to noise interference. Reading scores of children in classrooms near train tracks were lower than scores of children whose classrooms were quieter. Score differences may be due to children's blockage of all sounds in a noisy environment.

*155. Caffarella, Edward P. The acoustics of educational facilities. Audiovisual Instruction, v18 n10 p10-11, Dec. 1973.

Author discusses the importance of proper acoustics to a learning environment. In addition, he gives pointers on various acoustical treatments. Basic to his suggestions is his belief that not only the construction of an area, but also its ultimate purpose must be considered in the planning.

156. Chamberlain, Lawrence A. The Effect of Classroom Noise on the Acquisition Rate of a Sight Vocabulary by Kindergarten Children. M.A. thesis, University of Victoria, April 1975.

157. Christie, D.J. and C.D. Glickman. The effects of classroom noise on children: evidence for sex differences. Psychology in the Schools, v17 p405-408, 1980.

158. Crum, Michael A., and Noel D. Matkin. Room acoustics: the forgotten variable? Language, Speech, and Hearing Services in Schools, v7 n2 p106-10, April 1976.

Eleven classrooms for hearing impaired children were evaluated with respect to noise levels and acoustic treatment to minimize reverberation.

159. Dunn, R., and K. Dunn. Teaching Students Through Their Individual Learning Styles: A Practical Approach. Reston, Virginia: Reston Publishing Co., 1978.

Based on a growing body of research which evidence a diversity of learning styles among students, the authors propose that individuals differ in their preference for, or sensitivity to sound and therefore require different acoustic environments to perform academically at their best.

**160. Edmonds, Ed M., and Lyle R. Smith. The Effects of Classroom Noise on Student Performance. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA, April 23-27, 1984. 12p. Available ERIC. ED 244 381.

To clarify the effects of noise, sex, and intelligence on student performance, 289 sixth-grade students were randomly assigned either the Standard Progressive Matrices (SPM) or the STEP Reading Test Form 3 (STEP III) to be taken under high- or low-noise classroom conditions, with gender and intelligence as variables. Students who took the SPM while listening to low levels of previously recorded classroom noise performed better than did students in the high-noise-level group. When below-average intelligence students took the STEP III under high-noise conditions, their test scores improved, while above-average intelligence students performed best on STEP III when noise levels were low. Students with above-average intelligence did significantly better on both tests, in both noise settings. This study supports the contention that the effect classroom noise has on student performance depends on the task involved, but does not support previous findings that suggested sex was a significant variable in determining student performance under various noise-level conditions.

*161. Ellenburg, F.C., and Roxie Russell. Sixth grade students' opinions of noise in their classroom. Clearing House, v49 n7 p327-28, March 1976.

The primary purpose of this study was to determine whether noise in the classroom bothered the teacher or the student the most.

**162. Federal Aviation Administration. Study -- The Feasibility, Practicability and Cost of the Soundproofing of Schools, Hospitals, and Public Health Facilities Located Near Airports. Report to Congress. Washington, D.C.: Federal Aviation Administration (DOT), July 1977. 52p. Available ERIC. ED 148 029.

This report fulfills the requirement of Public Law 94-353 that requires the Secretary of Transportation to report to the Congress with respect to the feasibility, practicability, and cost of soundproofing noise-impacted schools, hospitals, and public health facilities, in order to reduce the possible adverse effects of aircraft noise. A survey of the impact of aircraft noise on 60 school and hospital buildings was conducted near six major U.S. airports within Noise Exposure Forecast (NEF) areas to acquire a representative sample of aircraft noise impact on such buildings nationwide. Building modifications for noise reduction purposes were estimated for the sample of 60 buildings. Resultant noise reductions and costs provided a basis for extrapolation to all such buildings within a NEF impact area around airports nationwide.

**163. Fitzroy, Dariel, and John L. Reid. Acoustical Environment of School Buildings. New York: Educational Facilities Labs, Inc., 1963. Available ERIC ED 031 070.

A field study was made of the acoustical environment of schools designed for increased flexibility to meet the spatial requirements of new teaching methods. The object of the study was to define all the criteria for the acoustical design of this type of classroom including the determination of -- (1) minimum acoustical separation required for effective group and individual work, (2) tolerable sound levels, and (3) objectional types of sounds. The resulting data was intended as a guide for architects, engineers, acoustical consultants, and educators. Questionnaires dealing with the aural environment of their schools were sent to teachers in thirty-seven schools in all parts of the country. Teams of acoustical consultants then analyzed each school to accurately determine noise reduction, reverberation, speech interference level and articulation index. The collected data, discussion, and conclusions are presented for each school studied.

*164. Fitzroy, Dariel. What you should know about acoustics. School Management, v14 n8 p20-27, Aug. 1970.

A private firm is operating a program for public schools that has improved the reading and math skills of potential dropouts.

165. Frese, Claudia W. Give your school the silent treatment: carpet the walls too. American School and University, v46 n2 p47-48,50,52, Oct. 1973.

A series of field experiments were conducted to measure noise levels before and after installation of floor and of wall carpet and a combination of floor and wall carpet; and to evaluate the efficiency of each carpet installation in terms of overall noise reduction.

166. Glass, Kenneth. Sonic environment. CEFP Journal, v23 n4 p8-11, July-Aug. 1985.

A number of studies show that school building noise interferes with the efficiency of students and teachers, lessens attention, and makes concentration on tasks more difficult. Effective noise control measures should be taken at all phases of school building design and construction.

167. Green, K.B., B.S. Pasternack and R.E. Shore. Effects of aircraft noise on reading ability of school age children. Archives of Environmental Health, v37 n1 p24-31, 1982.

The percent of students reading below grade level from 1972 to 1976 was regressed on racial, socioeconomic, educational, and noise level variables for all elementary schools in Brooklyn and Queens, New York. Schools were assigned noise exposure scores based on Noise Exposure Forecast contours for New York City airports. The correlations between these noise scores and a variety of noise level metrics ranged from 0.74 to 0.97. The regression coefficients adjusted for confounding factors indicated that an additional 3.6% of the students in the noisiest schools read at least 1 year below grade level with 95% confidence limits from 1.5 to 5.8%. The dose-response relationship indicated that the percent reading below grade level increased as noise level increased.

*168. Hammon, Stratton. Sound polluted schools. School Management, v14 n11 p14-15, Nov. 1970.

Acoustical engineer gives expert testimony in a lawsuit.

*169. How to design a quiet school. The American School Board Journal, v156 n5 p21-25, Oct. 1968. ED 025 134. Not Available ERIC.

Problems of sound insulation and control particularly in areas where there is a high level in exterior noise conditions, resulted in this study to determine approaches to sound control in school construction. After a general discussion of noise problems in school districts and teaching situations, two examples of sound control solutions are described in detail. Major areas occur in classroom arrangement and building materials with sound alternation systems related to roof-ceiling, wall-opening, and air-conditioning. Special emphasis is given to discussing sound measurement, and actual control methods used in the examples, including detail drawings.

**170. Ikenberry, L.D. School noise and its control. Journal of Environmental Health, v36 n5 p493-498, April 1974. NIOSH-00024044.

A survey of the problem of noise compatibility for a school and its surroundings reveals inadequate selection of school construction sites causes a noise interference in classrooms severe enough to cause abandonment of entire school buildings. Noise also affects learning, causing the student to make more mistakes and work less efficiently. Noise levels are tabulated for external and internal sources affecting schools. To control noise, the Washington State Board of Health has adopted the following regulations: maximum acceptable noise limits for school sites; noise considerations during design; maximum levels for amplified music; and limited noise exposure in school shops. A series of recommendations are made for effective sound control in schools, based on the Noise Criterion (a single value referring to a curve that indicates the maximum allowable decibels sound level at any frequency).

171. Important internal sources of noise in schools. Environmental Health Safety News, v27 n1-6 p1-10.

172. Jewell, Larry R., and others. Effects of noise on reading comprehension. Journal of the American Association of Teacher Educators in Agriculture, v20 n3 p25-30,53, Nov. 1979.

A study compared the effects of two different noise intensities on the cognitive performance of students. Findings indicated that at the higher noise intensity in the learning environment, performance on the reading comprehension task decreased.

*173. Kingsbury, H.F. Acoustics in the changing classroom. Educational Technology, v13 n3 p62-64, March 1973.

The author summarizes technical knowledge in the acoustical and design fields and presents it in a form usable to educators and their architects for use in planning classrooms with optimal acoustical conditions.

**174. Kingsbury, H.F., and F.M. Strumpf. The Development and Testing of Guidelines for Designing School Classrooms to Maximize Hearing Conditions and Provide for Effective Noise Control. Final Report.

University Park: Pennsylvania State Univ., Coll. of Engineering, Nov. 1969. 91p. Available ERIC. ED 040 603.

Speech intelligibility was tested in three classroom type spaces, one of 700 square feet, and two of 200 square feet, using student listeners and recorded test material. One of the latter two classrooms was fully carpeted. From the results, a set of acoustic guidelines were drawn that can lead to significant improvement in speech perception in actual classrooms.

175. Knapp, Clifford. Noise pollution. Instructor, v80 n9 p52-3, May 1971.

*176. Knirk, Frederick G. Acoustical and visual environments affect learning. Audiovisual Instruction, v15 n8 p34-5, Oct. 1970.

Undesirable background noises, poor amplification of desired sounds and inappropriate brightness levels can have adverse effects on the psychological and physical health of students and staff in a school. Some common problems and their solutions are identified. Acoustical and visual environments should be designed by an instructional technologist after projected teaching/learning activities in various areas are identified.

**177. Kyzar, Barney L. Noise pollution and schools: how much is too much? CEFP Journal, v15 n2 p10-11, March-April 1977.

At what point and to what degree does loud noise interrupt or hamper the process of education? This article attempts to answer this question by presenting data relative to a school affected by the placement of a traffic artery.

**178. Kyzar, Barney L. Comparison of Instructional Practices in Classrooms of Different Design. Final Report. Natchitoches, La.: Northwestern State Univ., Jan. 30, 1971. 76p. Available ERIC. ED 048 669.

This study compared various instructional practices and problems in open plan classrooms with practices and problems in conventional plan school buildings. One secondary and three elementary schools having open plan classrooms were each paired with a comparable school having conventional classrooms. Instruments were used to record: teaching techniques, psychological climate, social organization, order maintaining techniques, provisions for individual differences, and activities utilized in the instructional program. A sound survey was conducted in each of the schools to determine the amount of noise transmitted between instructional areas or rooms, and sound level readings were taken during instructional periods to ascertain actual classroom noise levels. The evidence gained in this investigation indicated that noise is not a problem in open space schools.

179. Lane, C.D. The Effects of Three Types of Background Music on Selected Behaviors in an Elementary School Setting. PH. D. thesis, University of Tennesee, 1976.

**180. Langdon, F.J., Scholes, W.E. The Traffic Noise Index: A Method of Controlling Noise Nuisance. London, England: Ministry of Public Building and Works, Building Research Station, April 1968. 20p. Available ERIC. ED 035 210.

A version of this paper was published in the Architects' Journal, v147, April 1968. This building research survey is an analysis of the social nuisance caused by urban motor ways and their noise. The Traffic Noise Index is used to indicate traffic noises and their effects on architectural designs and planning, while suggesting the need for more and better window insulation and acoustical barriers. Overall concern is for -- (1) finding unacceptable noise levels, (2) discovering how traffic noise is propagated, and (3) determining effective traffic noise control for buildings. Graphs and charts are used to distinguish the relationship between noise levels and distances.

*181. Larson, George, and Brenda Petersen. Does noise limit the learning of young listeners? Elementary School Journal, v78 n4 p264-5, March 1978.

Two major considerations for educators of young children arise from the results of a study which compared the speech-discrimination performance of 40 young children with that of 40 young adults: (1) young children whose hearing is normal have significantly more difficulty in understanding speech against a background of noise than adults have; (2) the range of speech-discrimination in-noise scores for the children indicates great variability in their abiity to cope with even low levels of noise or competing messages.

182. Lewis, P.T. Noise in primary schools: implications for design. Journal of Architectural Research, v6 n1 p34-37, March 1977.

An evaluation of various plan forms for primary schools analyzes school activities in terms of their acoustic characteristics. The acoustic properties of different teaching spaces and the extent to which these meet the needs of the various types of activity are discussed.

**183. Lortie, L.J. Acoustical Environment for Academic Buildings Speech presented at the 54th NAPPA Annual Meeting, Universite de Montreal, Quebec, Canada, April 30-May 5, 1967. 16p. Available ERIC. ED 031 886.

Discussion of the parameters governing noise control and room acoustics are followed by a demonstration on how to achieve a good acoustical environment. Topics emphasized include -- (1) design and control objectives, (2) noise sources and propagation, (3) reverberation parameters, (4) noise control factors and parameters, and (5) sound systems. Also included are -- (1) a table of area noise criteria factors, (2) five acoustical specification charts, and (3) a forum and question period.

184. Luck, G., et al. Sound Control in Music Rooms. Edmonton: Edmonton Public School Board staff study: unpublished, June 1977. 50p.

This study was designed to determine the acoustical problems in junior and senior high school band rooms and to recommend modifications for present rooms and standards for future rooms. The two main aspects of the study involved (1) a measurement of the sound characteristics in a sample of junior and senior high school music rooms, and (2) a questionnaire of music teachers and students in the junior and senior high band programs.

185. McCandless, David. Some sound advice or a short course in school acoustics. CEFP Journal, v15 n3 p12-14, May-June 1977.

The two major areas of acoustical problems are room acoustics and noise control. Some parameters of these areas are identified to illustrate that the best acoustical solutions occur in comprehensive planning at the very beginning of a project.

*186. McKay, Ronald L. How to keep school noise at the right level. The Nation's Schools, v74 n4, Oct. 1964.

Discusses factors to be considered during school planning stages regarding noise levels and acoustical design implications. Factors are -- (1) a stage house is detrimental to orchestras, bands, choruses, lectures, assemblies, recitals, and certain dramas and speech-music performances. Suggested is an auditorium with audience and performing platform within the same space and under the same continuous ceiling -- an open stage, (2) steeply sloped floors in auditoriums or lecture halls permit better views and hearing -- shallow ramp forms should be avoided, (3) good rehearsal rooms for large musical groups must be 15 feet high minimum, and preferably 20 feel to 25 feet high -- there is no substitute for height. Speech classrooms should be about 30 feet square by 10 feet high. Flexible space must be considered in terms of proportions and acoustical quality, (4) carpeting in the classrom often makes use of other acoustic treatment unnecessary while cutting down on footfall and chair scraping noise. Fully upholstered chairs in auditoriums should also be considered, (5) auditoriums of 1000 seats or more need a sound amplification system planned from the onset with the rest of the auditorium being accommodated in the design and integrated with the room's acoustical design, (6) all parts of a construction system must be well balanced for the best acoustic environment, (7) controlled air flow noise or masking noise can be useful in office, classrooms, and similar small spaces, and (8) absorptive materials used in classrooms can be much thinner than those used in music rooms, auditoriums, and shops where a much thicker absorptive material and airspace is required.

**187. McVey, G.F. Sensory Factors in the School Learning Environment. What Research Says to the Teacher Series No. 35. Washington, D.C.: National Education Association, Association of Classroom Teachers, 1971. 36p. Available ERIC. ED 060 507. Microfiche only.

Through proper management of the sensory factors inherent in the classroom environment, teachers can improve the comfort, development, and academic performance of students. Some principles and practical procedures that may be applied directly by the classroom teacher are suggested in this pamphlet. A number of guidelines, references, and suggested readings are included.

**188. Meyer, Jo Ann, and Stanley R. Wurster. The Effect of Three Noise Levels on Task Attention and Performance in Reading and Math with Fifth and Sixth Grade Children. Jan. 1972. 30p. Available ERIC. ED 082 327.

For this study, a 5th and 6th grade team-taught classroom of 66 children was chosen. Three equivalent groups of 22 children each were matched on the basis of a pretest in math. Each group was given a different noise level treatment: quiet (45-55 decibels), average (55-70 decibels), and noisy (75-90 decibels). A tape recording of actual classroom noise was used for the average and noisy treatments and a soundproof room was used for the quiet treatment. The noise treatments were randomly assigned to each group. Math computation and reading sections of the Metropolitan Achievement Test, Form G, provided the study tasks. Measurements of task attention were taken every two minutes using a criterion for task attention. An analysis of variance showed no significant difference in the groups either in task attention or in math and reading performance.

189. Moch-Sibony, A. The effects of prolonged exposure to noise on certain psychomotor, intellectual and personality aspects of children -- comparison between a soundproof and a nonsoundproof school. Travail Humain, v44 n1 p169-178, 1981.

The effects were studied of prolonged exposure to noise on certain psychomotor, intellectual and personality aspects of children. The authors present the results obtained in a field study undertaken in a zone highly exposed to aviation noise. A comparison made between a sound-proofed and a non-sound-proofed school brought out the following facts: the children do not express any feeling of disturbances as to the frequency of airplane passage; yet, after prolonged exposure to the auditory stimulus, perturbations of certain intellectual, psychomotor and personality aspects are observed. The authors estimate that the numerous airplane passages are the cause of attentional troubles observed.

*190. Ollila, L.O., and L.A. Chamberlain. The effect of noise and object on acquisition of a sight vocabulary in kindergarten children. Alberta Journal of Educational Research, v21 n3 p213-19, Sept. 1975.

This study investigated the influence of classroom noise and two methods of presentation upon the rate at which kindergarten children learned four dissimilar words.

191. Orloske, Arthur J., and John S. Leddo. Environmental effects on children's hearing: how can school systems cope? Journal of School Health, v51 n1 p12-14, Jan. 1981.

Physical, social, and psychological environments have had substantial impact on the hearing efficiency of youth. During the neonatal, preschool, and school years, environmental factors have exposed youth to auditory damage. School administrators can plan and should implement acoustical measures in the design of their school buildings.

*192. Patton, James E., and others. Where do children study? Journal of Educational Research, v76 n5 p280-86, May-June 1983.

According to a study of 387 fifth- through ninth- grade students, distraction is a situationally influenced phenomenon, and students actively think about their study environments. A high percentage of students study with radio or television on, although it appears that these distractors should be removed from the ideal study environment.

193. Payne, Ifan. Subjective Assessments of Classroom Acoustics. Man-Environment Systems, S64 Sept. 1971.

194. Penman, Kenneth A., and others. Sports & noise: how much is too much? American School and University, v49 n7 p23,25, March 1977.

Acoustical studies in seven different spaces in the four buildings of the WSU athletic complex measured noise levels and sound reverberation rates. The spaces measured were far noisier and more reverberant than quality educational spaces should be. Suggestions are made for improvement.

195. Pirn, Rein. Acoustical misconceptions in open planning. Progressive Architecture, v53 n8 p74-75, Aug. 1972.

When openness becomes necessary, there is a way to tame its rampant acoustics.

196. Pirn, Rein. The open plan school: will it survive? American School and University, v50 n7 p72,74,76-7, March 1978.

Years of research and experience have helped us develop the guidelines that may yet salvage the acoustically dim record of open plan schools.

197. Pizzo, J.S. An Investigation of the Relationship Between Selected Acoustic Environments and Sound, an Element of Learning Style, as They Affect Sixth-Grade Students' Reading Achievement and Attitudes. Ph. D. thesis, St. John's University, 1981.

*198. Pizzo, Jeanne. Breaking the sound barrier -- classroom noise and learning style. Orbit, v13 n4 p21-22, Dec. 1982.

The author discusses previous research done on the effect of noise on learning. She then describes the results of her own research designed to examine whether male and female sixth graders would achieve higher reading scores and evidence more positive attitudes when the acoustic instructional environment was matched with their learning style preferences for sound (i.e., quiet or noisy). Results showed that students performed best when they were matched with their preferred acoustical environments and that those students who were mismatched showed not only impaired quality of reading achievement but also negatively affected intellectual ability, physical and emotional strength and emotional stability. The author presents five recommendations to assist teachers in altering the classroom environment so that students can take advantage of their preferred learning styles.

*199. Sampson, P. Hearing loss at a school dance. Lighthouse, v1 n17, Fall 1973.

Using a decibelmeter to test his classmates' hearing ability before and after a school dance, a high school physics student determines that sound levels are high enough to affect hearing to a measureable degree.

**200. Sargent, J.W., et al. The disturbance caused to school teachers by noise. Journal of Sound and Vibration, v70 n4 p557-572, 1980. NIOSH-00098606.

The disturbance to secondary school teachers by external noise was investigated in England. Questionnaires sent to 73 schools and completed by 999 teachers were analyzed. Noise measurements were taken at each school. Quantitative relationships were drawn between the proportion of teachers bothered by road traffic noise and the level of traffic noise outside the classroom. Very few teachers claimed not to be sensitive to or bothered by traffic noise. Teachers indicated that road traffic noise levels in excess of 60 decibels relative to the A-weighted scale (dBA) produced an unsatisfactory working environment and more teachers were bothered by road traffic noise than by internal noises above a level of 59dBA. A quantitative relationship was also established between the proportion of teachers bothered by aircraft noise and the level of this noise. Male and female response to traffic noise was almost equal. The authors estimate that only 18 percent of the secondary schools have classrooms exposed to noise levels above 65 dBA while half have no classroom exposed to noise levels above 50 dBA from road traffic. Based on previous noise disturbance surveys of occupants in dwellings, the authors conclude that high levels of traffic noise disturb a larger proportion of school teachers than occupants of dwellings. They suggest that the differences in response between teachers and occupants may be due to the fact that teachers are involved in an auditory task.

**201. Schellenberg, Ben. Noise and Sound Control in Open Plan Schools. 1975. 26p. Available ERIC. ED 109 801. Microfiche only.

This annotated bibliography includes summaries of 19 articles and reports dealing with noise control and acoustical design in school buildings. A brief introduction discusses the need for careful attention to acoustics in any school construction or remodeling project, with particular emphasis on the need for special acoustical measures in an open plan facility. Annotations range from approximately 50 to 150 words.

202. School designs...for innovation and noise control. Modern Schools, Feb. 4, 1973.

Noise is controlled by the use of carpeting and soft surfaces, as well as by a special 2-level ceiling design.

203. Slater, Barbara Ruth. The Effects of Noise on Pupil Performance. Ph. D. Dissertation. 113p. ED 022 316. Not available ERIC.

Effects of school noise conditions on student written task performance were studied. Three noise levels were examined -- (1) irregular interval noise, 75-90 decibels, (2) average or normal noise, and (3) quiet condition, 45-55 decibels. An attempt was made to reproduce noise conditions typical of the school environment. A second controlled experiment used similar conditions of white noise. Subjects were 263 seventh grade children from a small urban complex. The STEP (Sequential Tests of Educational Progress) Reading Test was administered both as a test and as worksheets. Questionnaires were used to determine perceptions of noise and anxiety scale. No significant differences were found in analysis of variance for speed and accuracy on test scores. No significant relationship was found between anxiety and perception measures and performance. Conclusions state that written tasks of relatively short duration are not affected by peaks of noise typically found in a normal school environment.

**204. Turner, Aaron Lynn. Sound Levels in East Texas Schools. Commerce: East Texas State Univ., 1970. 14p. Available ERIC. ED 043 957.

A survey of sound levels was taken in several Texas schools to determine the amount of noise and sound present by size of class, type of activity, location of building, and the presence of air conditioning and large amounts of glass. The data indicate that class size and relative amounts of glass have no significant bearing on the production of sound in a classroom, but that air conditioning, the location of the building with accompanying exterior noise levels, and the nature of classroom activity did have significant effects on sound levels, the last factor being the most influential. School planners should pay more attention to the acoustical environment in an attempt to abate noise levels.

205. Walsh, David P. Noise levels and annoyance in open plan educational facilities. Journal of Architectural Research, v4 n2 p5-16, Aug. 1975.

This paper investigates the special considerations in defining an acoustical environment acceptable for educational purposes. Reviews various approaches for anticipating the degree of dissatisfaction or annoyance in school spaces, including statistical distributions of class noise, and deals with some design recommendations.

**206. Walsh, David P. Rating System for Evaluating the Acoustical Environment of Existing School Facilities. Paper presented at Acoustical Society of America 82nd Annual Meeting, Denver, Colorado, October 22, 1971. 19p. Available ERIC. ED 062 692.

A major survey of all schools built prior to 1933 was conducted after the enactment of the Field Act, which, in California, required specific school construction standards for earthquake safety. One aspect of this study, the acoustical environment of San Francisco Schools, is described in this speech. The document outlines the following procedures: (1) for the acoustical portion of the survey, a field survey was made to establish the existing condition at the facilities; (2) deficit documentation, which involved matching the existing conditions against the district standards by computer, was then completed; (3) unit costs for corrective work on all substandard areas were developed; and (4) cost benefit tables that matched the deficit documentation with the unit costs for corrective action were established. Portions of the forms used and computer printouts are included.

**207. Weinstein, Carol S., and Neil D. Weinstein. The Effect of Noise in an Open Space School on Reading Comprehension. Paper presented at the Annual Meeting of the American Educational Research Association (Toronto, Canada) March 1978. 12p. Available ERIC. ED 154 357.

Parents and educators have expressed fears that high noise levels in open space schools may interfere with academic achievement. This investigation compared the reading comprehension of 60 fourth grade students in an open space school during periods both of quiet and of naturally occurring background noise. The reading tasks resembled normal classroom work and were administered by the teachers as part of the normal class routine. Noise levels during noise sessions averaged 13 decibels (A) higher than during quiet sessions. Despite this substantial difference, it was found that noise had no significant effect on accuracy or reading speed.

*208. Weinstein, Carol S., and Neil D. Weinstein. Noise and reading performance in an open space school. Journal of Educational Research, v72 n4 p210-13, March-April 1979.

This investigation compared the reading comprehension of 60 fourth-grade students in an open space school during periods of quiet and periods of naturally occurring background noise. Noise had no significant effect on accuracy or reading speed.

209. Wyon, D.P. Studies of children under imposed noise and heat stress. Ergonomics, v13 n5 p598-612, 1970.

**210. Yerges, Lyle F. Sound, Noise and Vibration Control, 1969. 203p. Available ERIC. ED 037 975.

This working guide on the principles and techniques of controlling acoustical environment is discussed in the light of human, environmental and building needs. The nature of sound and its variables are defined. The acoustical environment and its many materials, spaces and functional requirements are described, with specific methods for planning, designing and reorganizing facilities. Building and mechanical equipment sound control is reviewed in conjunction with -- (1) sound transmission, (2) sound barriers, (3) sound control, (4) sound reinforcement, and (5) sound absorption. Performance criteria are also cited, along with the legal, medical, and trouble-shooting aspects of the sound environment. Tables, charts, drawings, check lists and a bibliography are included.

211. Anderson, Tom. Health and safety procedures in the classroom. School Arts, v84 n9 p36-37, May 1985.

Health and safety guidelines for secondary and elementary art classes are outlined. It is the teacher's responsibility to insist upon compliance.

212. Art hazards in the classroom: B.C.T.A. learning conditions draft, 1980. B.C. Art Teachers Association Journal, v21 n2 p2-21, Mar. 1981.

This article includes safety standards for art education in general as well as specific recommendations for safety procedures in ceramics, printmaking, fabric and dye, and auxiliary areas.

213. Artists, take care. NJEA Review, v50 n6 p83, Feb. 1977.

A doctor suggests some precautions for the artist both in and out of the classroom.

**214. Barazani, G. Health and Safety in Schools. New York, N.Y.: Art Hazards News, Center for Occupational Hazards, 1979. 6p. NIOSH-00121206.

Aspects of health and safety in art schools are discussed in reprints of six articles. Topics covered include a description of a model health and safety art school committee, planning of art hazards courses, implementation of health and safety programs, upgrading of classroom health and safety training, ten common hazards in art schools, and safety measures to be used when students work alone with art materials.

215. Braithwaite, H. Crafts and Hazards to Health. Toronto: Ontario Crafts Council, 1980.

*216. Crawford, Mike. Art teacher beware! Health hazards in the arts and crafts. OSSTF Forum, v9 n1 p37, Feb. 1983.

Some of the art room hazards discussed are asbestos in soapstone and vermiculite, silica, cigarette smoking in conjunction with exposure to fumes and fibres in the art room, and inadequate ventilation systems. The author explains that an individual exposed to both smoking and asbestos fibres is 92 times more likely to develop cancer than someone not exposed to this combination of hazards.

217. Hamilton, Marcia. Safety precautions in fiber arts. School Arts, v79 n3 p45-46, Nov. 1979.

The author discusses the potential hazards of working with fibers, dyes, and wax in textile art projects: bacteria, dust, poisons, allergies, and fumes. Safety precautions for working with dyes are listed.

218. Harrison, John. Artsmart. Living Safety, n4 p26-29, Winter 1983.

Art and craft materials can be hazardous to health. Particularly vulnerable are the elderly, children, and people with health problems. Particularly hazardous are ceramics, printmaking, painting and sculpting. The hazards and precautions to take are described in this article.

219. Health Hazards in Arts and Crafts. Toronto: York-Toronto Lung Association, n.d.

220. Herr, James F., and Ervin A. Dennis. 50 steps to graphic-arts safety. School Shop, v32 n6 p54-55, Feb. 1973.

221. Hoffman, Donald H. Toxic art materials and their effects on older adults. Art Education, v34 n1 p35-36, Jan. 1981.

This article points out health hazards in some art materials, which may pollute the air, contaminate food and utensils, produce flammable vapors, cause chemical burns or allergic reactions, or damage the eyes and suggests how these hazards may be compounded in nursing homes or senior citizens' agencies. Safety tips are listed.

**222. Levy, B.S.B. Health Hazard Evaluation Determination Report No. 75-12-321 Cooper Union School of Art. Cincinnati, Ohio: Hazard Evaluation Services Branch, National Institute for Occupational Safety and Health, Report No. 75-12-321, August 1976. 24p. NIOSH-00056657.

Environmental investigations were conducted at the Cooper Union School of Art, in order to evaluate the exposure to materials used by artists and craftsmen. The results show that exposures to crystalline silica, benzene, methyl cellosolve acetate, and lead are potentially toxic at concentrations measured during the evaluation. Mineral spirits, lithotine, benzine, toluene, xylene, acetone, acetic acid, nitric acid, and styrene, as found in the printmaking areas and plastics molding room, were determined to be nontoxic. Concentrations of wood dust in the woodworking shop are believed to be capable of producing transient irritation of the respiratory tract. Exposures to fumes of copper, tin, and zinc in the metals casting area were determined to be nontoxic. Recommendations are made for the improvement and control of the hazards.

**223. Manitoba Department of Education. K-6 Art. Approved by the Minister of Education. Winnipeg: Manitoba Department of Education. Curriculum Development Branch, 1983. 587p. Available ERIC. ED 254 478.

A model elementary art curriculum for use in Manitoba schools is outlined. Appendices include lists of hazardous art materials.

224. McCann, Michael. Artist Beware. New York: Watson-Guptill, 1979.

225. McCann, Michael. Health Hazards for Manual Artists. New York: Watson-Guptill, 1979.

226. Olson, John R. Reducing liability: art department safety guidelines. Art Education, v34 n5 p41-42,44,46, Sept. 1981.

This article is intended to help school districts evaluate and monitor safety in the art classroom. It lists the responsibilities of administrators, teachers, students, and custodians. It suggests safety standards for the art facility and for use of tools, safety equipment, and hazardous materials.

227. Pennsylvania. Dept. of Health. School Health Program. Hazardous Materials and Media in the Art Class. Pittsburgh: Pennsylvania Dept. of Health, 1975.

228. Qualley, Charles. How the body reacts. School Arts, v84 n2 p42,60, Oct. 1984.

Art teachers should know about the chemical contents of art materials and understand how chemicals enter the body, what happens as a result, and what can be done to reduce chemical hazards. Three ways in which foreign substances enter the body, i.e., absorption, inhalation, and ingestion, are discussed.

229. Qualley, Charles A. Safety checks in the art room. School Arts, v81 n1 p6-9, Sept. 1981.

Suggests forms and procedures art teachers can use to monitor the safety of the art classroom and teaching ideas for promoting safety awareness in students.

**230. Rossol, M. Are Public School Art Materials Safe? New York, N.Y.: Art Hazards News, Center for Occupational Hazards, Inc. 1980. 2p. NIOSH-00121208.

Hazardous art materials that are used in schools are described. Hazardous materials include asbestos used as a modeling compound, benzene and carbon-tetrachloride used as solvents and thinners, methyl-alcohol and shellac used as fixatives, and turpentine and linseed-oil used as paint mixers. The author notes that one school curriculum guide currently in use recommends the use of several toxic and hazardous materials. She recommends the immediate recall of the guide.

231. Siedlecke, Jerome T. Potential hazards of plastics used in sculpture. Art Education, v25 n2 p21-26, Feb. 1972.

This paper discusses the thermoplastic and thermosetting resins presently being used by the artist, and the potential for exposure to the toxic chemicals and other hazards during the development of his creative work.

232. The state of the art: health hazards, conservation and new materials for the visual artist. Visual Arts Ontario, Nov. 1981.

This article reports on a conference organized to discuss the hazardous effects certain commonly used art supplies can have and the precautions that should be exercised. Artists are among the highest sufferers of cancer due to use of solvents, heavy metals, mineral dusts, gases, and other hazardous chemicals such as acids and alkalis. Adequate ventilation, proper use of protective equipment and basic safety equipment must become the concerns of art educators. Elementary, secondary and post secondary institutions must incorporate into their curriculum health and safety programmes regarding the use of art materials.

233. Toxic pen recalled in Texas. Jackson Citizen Patriot, May 15, 1984.

A paint-filled marker pen containing a toxic chemical which school children were sniffing has been voluntarily recalled from Texas stores because it was not properly labelled.

234. Wadden, Richard A., and Peter A. Scheff. "Estimation of activated carbon requirements for controlling air quality in an art workshop." from Indoor Air Pollution: Characterization, Prediction and Control. Somerset, N.J.: John Wiley and Sons, Inc., 1983.

A variety of solvents and other potentially hazardous compounds are typically used in art workshops, including acetone, styrene, toluene, benzene, methyl cellulose acetate, xylene, and others. Methyl cellulose acetate (MCA) was chosen as a representative paint and printing solvent. The authors demonstrate how activated carbon requirements for reducing indoor solvent odours may be estimated for several different control efficiencies.

235. Wheeler, Gary. Chemical hazards in the arts. Journal of Chemical Education, v57 n4 p281-282, April 1980.

Reviews primary routes of entry and potential hazards related to chemicals commonly found in artists' materials. Tables list the uses and hazards of solvents and airborne particles and dusts.

236. Advisory Task Force on Asbestos in Schools. Asbestos in Schools. Toronto: Metropolitan Toronto School Board staff study, 1980. 109p.

This report reviews several aspects of the problem posed by the use of asbestos in school structures, such as: the hazards, legislation, inspection, sampling and testing, data evaluation, corrective action, and disposal and operational precautions.

237. Asbestos in Public Buildings. Toronto: Ontario Ministry of Education, 1980.

This manual was prepared to provide guidelines for the inspection of school facilities for the presence of asbestos.

238. Asbestos in schools. An AS&U roundtable. American School and University, v57 n6 p12-14+, Feb. 1985.

A discussion among six professionals about the status and outlook for asbestos removal in schools. The experts call for state or federal standards for asbestos in buildings and cite lack of funding as a major problem.

239. Asbestos in your child's school: how to get rid of it. PTA Today, v10 n4 p18-19, Feb. 1985.

The dangers of asbestos and what can and should be done to make the school a safe place for children are discussed.

*240. ATA asks for asbestos check in schools. ATA News, v14 n19 p4, Jan. 9, 1980.

Concern about the possible presence of asbestos in schools has prompted the Alberta Teachers' Association to request that the government conduct a thorough study.

**241. Baldwin, Cynthia A. Asbestos in Colorado Schools. M.Ed. Thesis, Colorado State University, 1981. 80p. Available ERIC. ED 258 828.

This study determined, by means of a random sample, how many of Colorado's public schools have asbestos materials and estimated the potential risk of exposure presented by these materials. Of the 41 schools sampled, 76 percent had asbestos materials in one or more locations. The values for the exposure potential ranged from very low to very high, with the majority presenting high exposure potentials. It is estimated from these results that from 63 percent to 89 percent of the public schools in Colorado may have asbestos materials which present potentially serious hazards to individuals using these facilities.

242. Becker, Susan. Asbestos in the classroom. Instructor, v94 n3 p122-23, Oct. 1984.

Thousands of schools contain dangerous asbestos which threatens the safety of students and teachers. The Environmental Protection Agency can be contacted to inspect and advise on this problem. Suggestions are offered for school personnel who suspect their school may contain asbestos.

243. Charette, Mike L. Arizona's school asbestos program. Journal of Environmental Health, v45 n3 p135-37 Nov-Dec. 1982.

The state of Arizona Department of Education operates a successful program to remove asbestos-containing building materials from schools, drawing from the expertise of the Department of Health Services, Bureau of Environmental Hygiene and Sanitation, Bureau of Waste Control, and eliciting cooperation of school officials. Includes an asbestos detection/control flow chart.

244. Chiljean, Roger A. A pro talks about asbestos. American School and University, v52 n11 p34 July 1980.

Outlines steps in the asbestos correction procedure and discusses establishing a management monitoring system.

**245. Congress of the U.S. Asbestos School Hazard Detection and Control Act of 1979. 96th Congress, 1st Session. Washington, D.C.: Congress of the U.S., May 15, 1979. 25p. Available ERIC. ED 177 742.

This report by the Committee on Education and Labor of the House of Representatives endorses H.R. 3282, the Asbestos School Hazard Detection and Control Act of 1979, and also presents minority views of ten members of the committee. The purpose of this legislation is to authorize a systematic federal program for identifying and controlling hazardous asbestos conditions in elementary and secondary schools. This program will take the form of technical, scientific, and financial assistance to local educational agencies, including private schools. Provisions of the bill and its legislative consideration are presented. Testimony from hearings is summarized about asbestos health and safety hazards, asbestos exposure in schools, treatment of school asbestos hazards, and the need for a federal program. A section-by-section analysis of the bill and Congressional Budget Office cost estimates for implementation of this legislation conclude the report.

246. Controlling asbestos in schools. EPA Journal, v5 n7 p20, July-Aug. 1979.

Spurred by recent medical findings, the Environmental Protection Agency has initiated a program to help educators check their schools for asbestos-containing materials and correct any hazardous conditions which are found.

**247. Enterline, P.E. Extrapolation from occupational studies: a substitute for environmental epidemiology. Environmental Health Perspectives, v42 p30-44, Dec. 1981. NIOSH-00125039.

Methods to extrapolate occupational data to general environmental air pollution data are reviewed. Three linear models of extrapolating low levels of pollutants are discussed using Canadian, American, and British data. The application of one or more of these linear models to recently publicized asbestos exposures from hair dryers and public school buildings, and the predictions of asbestos exposure to cancer mortality are discussed. The author concludes that this method probably represents the only way of quantifying the health effects of low exposure levels of pollutants.

**248. Environmental Defense Fund. Petition to the Environmental Protection Agency to Control Asbestos Emmissions from Spray-On Materials Which Have Been Applied in Public School Buildings for Insulation, Fireproofing, Decorative or Other Purposes. Washington, D.C.: Environmental Defense Fund, Dec. 21, 1978 71p. Available ERIC. ED 168 147.

This petition requests the Environmental Protection Agency to promulgate regulations in compliance with section 6 of the Toxic Substances Control Act to control asbestos emissions from spray-on materials containing 1 percent or more asbestos that have been applied in public school buildings for insulation, fireproofing, decorative, or other purposes. Specifically, the petition requests the administrator of the agency to establish a program no later than March 1, 1979 that will identify all public schools in which these materials have been used. It also asks the administrator to require the manufacturers and processors of such fiber to take appropriate corrective action to eliminate the emission of asbestos fibers from surfaces that have been sprayed with it. The petition presents evidence that asbestos is a potent carcinogen capable of inducing lung cancer in the human population.

**249. Environmental Protection Agency. Asbestos-Containing Materials in School Buildings: A Guidance Document. Part 1. Washington, D.C.: Environmental Protection Agency, Office of Toxic Substances. March 16, 1979. 71p. Available ERIC. ED 170 946.

The Environmental Protection Agency (EPA) has worked with the states to develop a program for accurate information and guidance to deal with the problem of school buildings constructed with asbestos-containing materials. This is the first of two guidance manuals that are a major part of this program and are being mailed to all public school districts. They were prepared to inform administrators of the health hazards associated with asbestos and outline the steps that can be taken to identify asbestos-containing materials and to protect students and school personnel from exposure. Chapters constructed in a question and answer format discuss the concern about asbestos, its uses, steps involved in conducting an asbestos control program, and corrective action. Specifications and requirements for contractors are listed, as are sources of assistance from federal and state agencies. The appendices contain the asbestos regulations from three federal agencies, addresses of agencies involved in asbestos control, and a brief report, "Mineral Characterization of Asbestos-Containing Spray Finishes."

250. Faich, G.A. Asbestos hazard evaluation in Rhode Island schools. American Journal of Public Health, v70 n2 p162-164, Feb. 1980. NIOSH-00093164.

Asbestos hazards were studied in 326 Rhode Island public and private schools built between 1950 and 1973. The presence of spray on asbestos was confirmed in 24 schools. Of these, the material in 15 schools showed no visible deterioration but was classified as a potential hazard. Five schools had areas of minor deterioration, and four schools had major overt asbestos hazards. Hazard abatement for these schools involved removing the material, applying sealants, or both.

251. Figlio, Mary Ellen. Asbestos: no easy solutions. American School and University, v52 n2 p46-50, Oct. 1979.

Asbestos in the schools has become a serious problem. Current activity in inspecting for asbestos and plans for corrective action are discussed. Suggestions are offered administrators in choosing contractors for asbestos removal.

252. Figlio, Mary Ellen. Will government fund asbestos removal? This district didn't wait. American School and University, v52 n7 p32-35, March 1980.

A small district in New Jersey didn't wait for possible federal or state funds. Instead, it floated a special bond to cure its asbestos problems.

*253. Fischer, Bill. Asbestos: Killer still stalks nation's schools. NEA Today, v4 n3 p3, Nov. 1985.

Preliminary findings from a nationwide NEA school asbestos survey indicate that too many districts are using inadequate -- and even unsafe -- methods to rid schools of crumbling asbestos. The new data also underscore the need for a greater federal role in helping schools and colleges foot the tremendous cost of eliminating asbestos risks.

**254. General Accounting Office. School District Officials Face Problems in Dealing with Asbestos in Their Schools. Report to the Chairman, Subcommittee on HUD--Independent Agencies. Washington, D.C.: General Accounting Office, March 19, 1985. 66p. Available ERIC. ED 256 027.

To determine how school districts are handling the problems of asbestos in their schools, the General Accounting Office (GAO) conducted interviews and asked standarized questions of officials at 6 Environmental Protection Agency (EPA) regional offices, 12 state offices, and 36 school districts in 12 states. This report presents information on the framework in which decisions on asbestos are being made, the appropriateness of the abatement actions, and the quality of the abatement work. Researchers found asbestos in over one-half of the schools in districts visited. In these 36 districts, 28 used consultants and 12 reported difficulty in identifying qualified consultants, and over $51 million had been spent on asbestos abatement. Suggestions cited the most frequently by EPA, state, and school district officials and by at least one official at each level of government included: (1) require state certification of contractors and consultants, (2) establish an independent governmental unit to monitor and inspect abatement actions, (3) provide better technical guidance and assistance, (4) establish a definitive standard specifying the level of exposure that should be abated, (5) provide more information about asbestos hazards and remedies, and (6) increase federal funding for abating asbestos.

255. Harris, Bonnie Lee. Asbestos analysis: what school officials should know. American School and University, v56 n7 p68,70,72, March 1984.

Transmission electron microscopy and scanning electron microscopy are used to detect asbestos by analyzing filters from air tests. The modes of operation and types of samples examined by each are explained. Circumstances that a school board should consider when deciding whether to use these methods are discussed.

*256. Harris, George. Sidestep asbestos hysteria: explain the risk (and your response) to the public. American School Board Journal, v171 n4 p36-37, April 1984.

A slide show and community discussions helped set the stage for a calm and constructive asbestos abatement project in Montgomery County, Alabama.

**257. House Committee on Education and Labor. The Attorney General's Asbestos Liability Report to the Congress. Pursuant to Section 8(b) of the Asbestos School Hazard Detection and Control Act of 1980. Committee Print, Ninety-Seventh Congress, First Session. Washington, D.C.: Congress of the U.S., Nov 1981 245p. Available ERIC. ED 214 256. Microfiche only.

The Attorney General was directed by Congress to prepare a report on whether the United States could recover, from any persons determined liable, the amounts expended to detect, contain, or remove hazardous asbestos products from schools. The general background portion of this report contains the results of the factual research and investigation. It briefly sets forth some of the uses of asbestos and describes the asbestos industry and the diseases attributed to inhalation of asbestos fibers--asbestosis, lung cancer, and mesothelioma. This section also explores documents that indicate industry knowledge of the dangers of asbestos fibers as early as the 1930s. Asbestos problems in the schools are discussed and suits already filed by two school districts are described. The legal issues portion of the report commences with a summary of the problems of duty, breach of duty, injury, limitations, and economic loss. Equitable and common law theories of recovery and the potential liability of parties other than asbestos manufacturers are discussed. The report concludes that litigation by school authorities, rather than by the federal government, should be quickly investigated as one potential means of reducing the fiscal impact on taxpayers of abating asbestos hazards in the schools.

**258. House Committee on Education and Labor. _Oversight Hearings on Asbestos Health Hazards to Schoolchildren. Hearings before the Subcommittee on Elementary, Secondary, and Vocational Education of the Committee on Education and Labor. House of Representatives, Ninety-Sixth Congress, First Session on H.R. 1435 and H.R. 1524 (January 8, 16, and February 22, 1979)_. Washington, D.C.: Congress of the U.S., 1979. 815p. Available ERIC. ED 177 676. Microfiche only.

> Testimony and prepared statements presented during three days of hearings in January and February, 1979, concern the problems of asbestos in school buildings. Medical research indicates that the inhalation of asbestos dust vastly increases a person's chances of contacting fatal diseases such as lung cancer, mesothelioma, and asbestosis. Asbestos materials were heavily used in school construction between the years 1946 and 1972. Most of the regulations and safety procedures concerning asbestos apply only to industrial settings. The purpose of the hearings was to establish a program for the inspection of schools for the presence of asbestos materials, to provide funds for the testing and evaluation of potential hazards, and to create a loan program to assist in the containment or removal of imminent hazards to health and safety. Testimony was offered by several nationally recognized experts in the field of asbestos control, particularly in relation to schools. Other witnesses are from federal agencies, and state and local school groups who have been working on the problem. Several companies that have been involved in the manufacture or installation of asbestos materials shared their expertise, as did legal experts who have criticized current regulatory efforts as inadequate. The text for each bill is included. Both H.R. 1435 and H.R. 1524 are cited as the "Asbestos School Hazard Detection and Control Act of 1979."

**259. Irving, K.F., R.G. Alexander, and H. Bavley. Asbestos exposure in Massachusetts public schools. _American Industrial Hygiene Association Journal_, v41 n4 p270-276, April 1980. NIOSH-00095209.

> Asbestos exposures in 1,425 Massachusetts public schools were evaluated by walk through inspections, review of construction records, questionnaires distributed to school officials, and bulk and air sample analysis. All of the target schools had been built or had had major construction done between 1946 and 1973. Responses to the questionnaires were received from only 27.4 percent of the target schools, and many contained

inaccurate information concerning the use of spray on asbestos materials. Of 261 bulk samples, 173 contained asbestos. Most air samples contained less than 0.04 asbestos fibers per cubic centimeter (fibers/cc). Samples from four schools contained 0.06 to 0.16 fibers/cc. The asbestos material in these schools was badly damaged. For 49 of the schools with documented asbestos exposures, control actions were recommended.

260. Is a killer loose in your classroom? Instructor, v89 n2 p32-33, Sept. 1979.

Discusses the harmful effects of exposure to asbestos in the classroom, and provides addresses of ten regional Environmental Protection Agency Officers.

261. Johnson, Kirk A. EPA's program for asbestos containing materials in school buildings. School Business Affairs, v45 n10 p25, Oct. 1979.

The Environmental Protection Agency (EPA) comments on three recommendations contained in an article in a previous issue of this journal about inspecting schools for asbestos-containing materials.

262. Keller, Ed. Asbestos, EPA, and the real issue. National Elementary Principal, v59 n4 p61, June 1980.

The Environmental Protection Agency's regulations on use of asbestos in school buildings are not based on an "acceptable level of risk," require action by the consumers rather than by the producers of the hazardous substance and do not extend to other public facilities that theoretically place citizens in similar danger.

263. Lang, Robert D. The continuing problem of asbestos in the public schools. Journal of Law and Education, v14 n1 p23-41, Jan. 1985.

Outlines the significant health problems caused by asbestos materials in school buildings throughout the United States in general and in New York in particular. Describes state and federal statutes and the financial problems that result in noncompliance and argues for available federal funding for asbestos inspection and mandatory removal.

**264. Lang, Robert D. Danger in the Classroom: The Continuing Problem of Asbestos in the Public Schools. 1984. 36p. Available ERIC. ED 253 297.

Asbestos in school buildings continues to threaten the future health of children. Because of prolonged exposure while their metabolism and activity levels are relatively high and their cellular development is relatively rapid, children and adolescents have a lifetime risk of developing asbestos-related diseases -- such as asbestosis, mesothelioma, and cancer of several organs -- a risk that is greater than that of adults who work with asbestos. Few local educational authorities can pay for the expensive work needed to correct the problem, and federal financial aid is not available. The health hazard persists; in particular, compliance of New York State school districts with federal and state statutes addressing the problem remains low. Crucial deficiencies in existing legislation exist: the federal Hazard Detection and Control Act fails to mandate removal or encapsulation of hazardous materials, and New York's School Asbestos Act fails to provide adequate protection to individuals occupying school buildings not used as public schools. Current approaches to solving the asbestos problem are clearly inadequate, and alternative solutions must be formulated and pursued promptly. A first step would provide federal funding for asbestos inspection and mandatory removal. A total solution might be attained through combining the funding of mandatory measures with the Environmental Protection Agency's new and aggressive policy of proposing and imposing heavy fines on noncomplying school districts.

**265. Le Guen, J.M., and G. Burdett. Asbestos concentrations in public buildings - a preliminary report. Annals of Occupational Hygiene, v24 n2 p185-189, 1981. NIOSH-00119381.

Concentrations of asbestos in various public buildings was determined. Using several sampling and analytical methods, airborne asbestos concentrations were measured in four schools, two other educational institutions, five houses, a television studio, and a theater. Asbestos containing building materials had been used at all of the test sites. Airborne asbestos concentrations all were less than 0.000000009 gram per cubic meter. At some sites, damage to the asbestos building materials was noted, and exposed fibers were visible.

*266. Levin, Dan. Asbestos in schools: walls and halls of troubles. American School Board Journal, v165 n11 p29-32 Nov. 1978.

Discusses the difficulties involved in determining the asbestos hazard in a school and steps that are being taken to help resolve the problems.

*267. Levin, Dan. Asbestos removal is expensive, and you're about to be handed the bill. American School Board Journal, v166 n11 p32,49, Nov. 1979.

Describes the current, unsettled status of federal programs for the removal of friable asbestos from the schools and the method of financing such removal.

268. Levins, Hoag. Asbestos testing: is the EPA misleading you? American School and University, v56 n1 p35-38,40 Sept. 1983.

Experts warn that only electron microscopes can see the smaller fibers of asbestos that are known to cause the most cancers, though the Environmental Protection Agency still endorses optical microscopes for asbestos removal verification. Asbestos testing methods are explained and sources of information are provided.

269. Makruski, Edward D. Asbestos abatement: start to finish. American School and University, v56 n8 p59-61,64, April 1984.

An EPA survey of the largest school districts in the nation revealed that over 50 percent have not inspected for asbestos and two-thirds have failed to notify parents adequately. Seven steps are therefore provided for successful asbestos abatement, in anticipation of tougher regulations now under consideration.

**270. Martin, B., J. Hodges, P. Hallett, and J. Osterhaus. Asbestos Abatement in Oklahoma Schools. National Institute for Occupational Safety and Health. Grant No. 1 OH-01049-01, 24 pages. September 1980. NIOSH-00112388.

Information for the removal or encapsulation of asbestos from public schools is presented. The necessary notifications, permits, protective equipment, training, air monitors and medical examinations are outlined. Requirements for emergency evacuation plans, caution signs, inspections, ventilation, wall and floor protection and the isolation of contaminated areas are discussed. Approved protective equipment, contractors and supplemental materials are listed.

*271. McCormick, Kathleen. Asbestos: the clock is ticking in your schools, and inaction could prove to be devastating. American School Board Journal, v171 n4 p33-36 April 1984.

This article urges districts to meet federal regulations and protect students and staff from hazardous asbestos. Medical risks, compliance procedures, costs of asbestos removal, consequences of noncompliance, legal ramifications, and contacts for further information are discussed.

*272. McCormick, Kathleen. Progress and new problems mark your battle against school asbestos. American School Board Journal, v172 n3 p25-29, March 1985.

Reviews a survey of asbestos in the schools and the status of asbestos regulations enforcement policy. Reviews the status of asbestos litigation and recovery of abatement costs. Provides suggestions for choosing asbestos abatement contractors.

*273. McCormick, Kathleen. Weigh these factors in developing your legal strategy on school asbestos. American School Board Journal, v172 n3 p33, March 1985.

Presents factors to consider in deciding whether to have a school included in the national class action suit that is being brought against 54 asbestos manufacturers.

**274. McCrone, W.W. Evaluation of asbestos in insulation. American Laboratory, v11 n12 p19-31, Dec. 1979. NIOSH-00093167.

Guidelines for asbestos sampling in United States schools are presented. Techniques for identifying the composition of insulation, soundproofing, and other building materials are discussed. Microscopic equipment used for fiber differentiation and quantitative chemical assessments are reviewed. Environmental Protection Agency (EPA) recommendations for friable materials sampling, preliminary analysis procedures to assure inclusion of principal fibers, and for polarized light microscopy for amphibole and serpentine identifications are included. The physical properties of various asbestiform minerals and representative slides of 15 minerals are given along with appropriate slide preparation techniques.

275. McQuaig, Linda. Fighting deadly fibres. Maclean's, v94 n46 p24+, Nov. 16, 1981.

276. Millet, C. Les techniques de controle de l'amiante dans les batiments. Hamilton: Centre canadienne d'hygiene et de securite au travail, 1985.

277. Millet, C. Techniques For Asbestos Control in Buildings. Hamilton: Canadian Centre for Occupational Health and Safety, 1985.

278. Missouri Workshops On Asbestos Treatment In Schools. Cincinnati, Ohio: National Institute for Occupational Safety and Health. Department of Health and Human Services, Grant No. 1-R18-OH-01054-01, 1981. 7p. NIOSH-00130822.

An educational program was developed for asbestos treatment in schools at the University of Missouri Columbia campus. The program consisted of four phases: an on campus, in house training program for school employees, with the development of prototype training materials; removal of asbestos using all correct protocols from a room on the campus, with refinement of training materials; statewide workshops on proper asbestos handling for workers and professionals; and continuing promotion of the workshop concept and distribution of workshop training materials. There were 92 participants in the program, including contractors and workers, and officials from federal and state agencies, construction inspectors, industrial hygienists, lawyers, industrial safety and health professionals, and educators. The curriculum format proved to be workable and there was a first hand understanding of the equipment and procedures involved in safe asbestos removal work. The authors conclude that post workshop analyses show that most of the objectives of the training session were met.

**279. National Education Association. Selected References on Asbestos: Its Nature, Hazards, Detection, and Control. Washington, D.C.: National Education Association, May 1981. 22p. Available ERIC. ED 208 469. Microfiche only.

This document provides teachers with sources of information about the nature, hazards, detection, and control of asbestos. Because many school buildings include asbestos-containing materials, teachers and other school personnel must be aware of the potential dangers to students and to themselves and take steps to have asbestos hazards contained or eliminated. In addition, they should be able to enlighten students about the dangers of asbestos when the need arises. The references listed were located through an extensive search of the literature and publications of concerned organizations and agencies. Along with citations of federal laws and regulations and of documents on asbestos, a list of organizations and agencies offering services and information is presented. Also included is a brief guide on how to reduce exposure to asbestos in the schools.

280. Nicholson, William J. Control of Sprayed Asbestos Surfaces in School Buildings: A Feasibility Study: Report to the National Institute of Environmental Health Sciences. New York: Environmental Sciences Laboratory, Mount Sinai School of Medicine of the City University of New York, 1978. 71p.

**281. Nicholson, W.J., et al. Asbestos contamination in United States schools from use of asbestos surfacing materials. Health Hazards of Asbestos Exposure, Annals of the New York Academy of Sciences, Vol. 330, pages 587-596, 1979. NIOSH-00096347.

Samples of surfacing materials used in schools throughout the United States were analyzed for asbestos content. In New Jersey schools, 64 samples were obtained from classrooms, hallways, auditoriums, cafeterias, locker rooms, and custodial or boiler rooms. Visual inspection and analysis of samples revealed three types of asbestos containing materials: a loose, friable fibrous asbestos spray material, a moderately dense asbestos spray material, and a plaster or textured paint material with an asbestos binder. About 66 percent of the schools with asbestos surfaces had some visible evidence of damage to the material. X-ray diffraction confirmed the presence of asbestos in sampled materials. Air samples were taken in 10 schools located in New Jersey, New York, and Massachusetts, which had visible damage of asbestos materials. Samples were collected on 0.8 micrometer pore size membrane filters and analyzed for chrysotile asbestos content using electron microscopy. Chrysotile asbestos concentrations ranged from 9 to 1,950 nanograms per cubic meter (ng/cu m). The author concludes that damaged asbestos containing material increases asbestos air concentrations, and warns against the long term exposure of children to asbestos concentrations above 100ng/cu m.

**282. Novick, L.F., et al. Asbestos in Vermont schools: findings of a statewide on-site investigation. American Journal of Public Health, v71 n7 p744-746, July 1981. NIOSH-00119564.

The use of asbestos building materials in 336 Vermont schools was surveyed. Schools constructed or renovated between 1946 and 1974 were inspected to identify sites of asbestos materials, and air samples were collected for fiber analysis. Asbestos materials were found in 251 of the schools. These materials were most commonly used for pipe and boiler insulation. Student exposures to asbestos were noted in 105 of the schools; in 36 schools, one source of exposure was asbestos ceiling tiles. The authors note that this type of survey, in which trained inspectors are used to record exposures, is superior to self report types of surveys for accurately characterizing potential hazards.

**283. Oklahoma State Dept. of Education. Asbestos Abatement in Oklahoma Schools. Oklahoma City: Oklahoma State Dept. of Education, Sept. 1980. 27p. Available ERIC. ED 207 185.

The intent of this paper is to provide the information necessary to develop and implement an acceptable asbestos removal plan. The information is taken from current (September 1980) federal and state regulations and recommendations. The information describing asbestos removal operations is organized chronologically to simplify using this document as a guide in a step-by-step program for asbestos removal or encapsulation. Topics discussed include necessary notifications, permits, protective clothing and equipment, employee training, respirators, environmental air monitoring, medical examinations, record keeping, documentation, building occupancy, pre-renovation meetings, work area preparation, personnel decontamination, methods of asbestos stripping, and asbestos disposal. The appendices contain a letter from the state of New Jersey concerning encapsulation of asbestos; a list of 30 approved asbestos respirators and manufacturers' names and addresses; respiratory publications available; a suggested schematic representation of a typical decontamination unit for asbestos removal; and a list of asbestos resource personnel and contractors.

**284. Olson, Kristin. "Legal issues in asbestos litigation." 1984. 11p; in Jones, Thomas N., and Darel P. Semler, Ed., School Law Update...Preventive School Law, p124-133. Available ERIC. ED 244 332. Microfiche only.

Because asbestos exposure poses a serious health threat to school children, Congress enacted the Asbestos School Hazard Detection and Control Act in 1980, authorizing federal funds for local programs to locate and remove asbestos-containing materials. No funds have been made available as yet, however, and two-thirds of the affected schools have failed to comply with the law, since they cannot afford to do so. An alternative course for schools is to seek recovery against manufacturers responsible for asbestos installation. Accordingly, this chapter reviews bases of litigation, citing pertinent case law. A recent report by the Department of Justice concludes that schools may take action for equitable restitution against asbestos manufactureres to recover expenses incurred in removing the asbestos threat. But restitution requires schools to fund the removal outright, and then rely on litigation for reimbursement. Thus other bases of litigation are reviewed, including traditional theories of negligence, strict liability, and breach of warranty, as well as law of equity and bankruptcy. The latter has been used by manufacturers to evade massive litigation by potential victims. Schools searching for relief from asbestos hazards should therefore consider all theories of liability and all potential defenses in such suits.

**285. Piacitelli, L. Health Hazard Evaluation Report No. HETA-83-112-1309, Saint Francis High School, Morgantown, West Virginia. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health. May 1983. 9p. NIOSH-00133121.

Bulk samples were analyzed for asbestos at Saint Francis High School, Morgantown, West Virginia on January 21, 1983. The evaluation was requested by the principal to identify areas where asbestos could be present. A complete survey of the building was conducted and bulk samples were collected. The samples were analyzed by polarized light microscopy. Friable asbestos containing materials were found on some of the ceilings and on the walls above the lockers. Asbestos was also found in insulating materials used in the boiler room and on some of the pipes on the first floor. Most of the material was in good condition and would not be a hazard if undisturbed. The friable materials were well bonded to the ceilings and walls and encapsulated with paint. The author concludes that there is no asbestos hazard at the school, however, the friable material above the lockers is susceptible to contact damage and the paint would not be effective in preventing fiber release if damaged. The author recommends that the material above the lockers be removed because of its accessibility and friability.

**286. Reed, L.D. Health Hazard Evaluation Report No. HETA-82-179-1154, Wilmington High School, Wilmington, Ohio. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health. August 1982. 4p. NIOSH-00128114.

Ceiling materials were evaluated for asbestos content in classrooms at Wilmington High School, Wilmington, Ohio, on April 9, 1982. The evaluation request came from the business manager of the school on behalf of 2,200 students, teachers, and employees. Bulk samples of ceiling materials and particulate air samples were analyzed. The bulk samples indicated that eight of nine ceilings contained 20 to 30 percent chrysotile asbestos. No asbestos fibers were found in air samples. The author concludes that students, teachers, and staff are not exposed to airborne asbestos fibers. As long as the ceiling tiles remain uncompromised, no health hazard exists. If the integrity becomes compromised, appropriate sealants should be used, and in the event of installation or destruction of the ceilings, protective equipment should be used.

287. Robison, Rita. Asbestos removal: how safe is safe? American School and University, v53 n4 p42-45 Dec. 1984.

An asbestos removal consultant says safety standards must be improved and explains her asbestos removal training program.

288. Robison, Rita. Asbestos: what you can do about it. American School and University, v51 n9 p48,50,52,54-55 June 1979.

The Environmental Protection Agency has assembled technical information into a school asbestos program. Immediate steps that can be taken are outlined.

*289. Ross, Victor J. When a school asbestos problem surfaces, be prepared to move carefully, act swiftly -- and still suffer the sting of bitter public criticism. American School Board Journal, v172 n3 p34-35, March 1985.

When asbestos is discovered in a school, close the school and call the Environmental Protection Agency, then designate one administrator as a spokesperson for the media. It is important not only to manage the problem but to deal well with the public and the press, too.

290. Russek, William F. Asbestos: the case for encapsulation. American School and University, v53 n2 p32 Oct. 1980.

Encapsulation has proven to be the safest, surest, and most permanent method of treating sprayed asbestos on ceilings and walls. Federal aid is available to help pay for inspection of school buildings for asbestos and for asbestos removal.

**291. Safe Buildings Alliance. Asbestos in Buildings: What You Should Know. Washington, D.C.: Safe Buildings Alliance, 1984. 26p. Available ERIC. ED 259 437.

Thirty-one critical questions about asbestos, its use in school buildings, and the risks it poses to health are answered in this booklet. Issued by the Safe Buildings

Alliance, an incorporated association of manufacturers that once supplied asbestos-containing materials for building construction, the booklet's purpose is to provide information that will enable decision-makers to come to scientifically sound decisions concerning whether to regard asbestos-containing materials currently present in school buildings as a threat, and if so, how to deal with that threat safely. The questions concern how to identify asbestos-containing products, how to assess the threats they pose, when to repair and when to remove asbestos, what asbestos is, what normal levels of exposure are, why and how widely asbestos has been used, what diseases are associated with asbestos exposure, and who has corroborated the findings reported here.

**292. Sawyer, Robert N., and Charles M. Spooner. Asbestos-Containing Materials in School Buildings: A Guidance Document. Part 2. Washington, D.C.: Environmental Protection Agency, Office of Toxic Substances. March 1979. 123p. Available ERIC. ED 170 947.

Part 2 of the Environmental Protection Agency (EPA) guidance manuals consists of more detailed information on asbestos identification and control methods. Available information on sprayed asbestos-containing materials in buildings is summarized. Guidelines are presented for the detection and monitoring, removal or encapsulation, and disposal of asbestos-containing building materials. Measures available to protect workers and building occupants are presented, based on field measurements and theoretical considerations. Sampling procedures are discussed so that the user of this document can take an active role in determining whether protective action is needed and, if so, how best to protect himself, the public, and the environment.

**293. Sawyer, Robert N., and E.J. Swoszowski, Jr. Asbestos abatement in schools: observation and experience. Health Hazards of Asbestos Exposure, Annals of the New York Academy of Sciences, v330 p765-775, 1979. NIOSH-00096343.

Technical, social, and political factors that affect the performance of asbestos abatement programs undertaken in school buildings were discussed. Over 50 abatement programs were evaluated, and in most cases the performance was satisfactory. Several programs were cited that deviated from guidelines prescribed by the Environmental Protection Agency (EPA) and thus compromised the prevention of asbestos exposure to building users and workers. The most significant deficiencies of the programs included inadequate information available to school authorities, difficultly in locating competent material analysis, and contractor compliance with

OSHA and EPA regulations. They recommend the implementation of methods to correct these deficiencies.

**294. Sedrel, Roy A. Asbestos Abatement -- Practical Considerations. Paper presented at the Joint Annual Conference of the Illinois Association of School Boards, the Illinois Association of School Administrators, and the Illinois Association of School Business Officials (Chicago, IL, November 16-19, 1984). 8p. Available ERIC. ED 254 962.

Illinois Senate Bill 1644, the recently passed "Asbestos Abatement Act," requires all schools in the state, public and private alike, to remove friable asbestos by whichever comes first: July 1, 1989, or 3 years following the establishment of a system for state funding for corrective action. This document addresses practical considerations in implementing this Act. The first part addresses legal issues arising from the language of the Act. These include the practical definition of "friable asbestos," what to do about ceiling tile and nonfriable asbestos-containing materials, and the definition of "significant health hazard." The next part discusses the three methods of corrective action suggested in the act: enclosure, encapsulation, and removal. Then 10 specifications are listed for removal of asbestos, covering credentials of the contractor, methods of removal, disposal of waste materials, decontamination procedures, and insurance. Procedures for selecting qualified firms for removal and monitoring are next addressed, along with guidelines on preparation of facilities prior to removal. The final section addresses the importance of documentation throughout an asbestos removal project.

*295. Speights, Daniel A., and Edward J. Westbrook. Heed this vital counsel on school asbestos litigation. American School Board Journal, v172 n3 p30-32, March 1985.

Decisions on school asbestos litigation are complex. Outlines strategies for deciding whether to consider filing suits against asbestos manufacturers individually or in the class action suit.

296. Stimson, Jim. Asbestos still a problem: who will pay? School Administrator, v40 n11 p22-24 Dec. 1983.

Administrators are advised of the background, costs, politics, and public relations of containing or removing hazardous asbestos from school buildings.

297. U.S. Environmental Protection Agency. Office of Toxic Substances. Asbestos-containing Materials in School Buildings: a Guidance Document. Research Triangle Park, N.C.: 1979.

298. U.S. Environmental Protection Agency. Office of Toxic Substances. Control Action Division. School Asbestos Program: Questions and Answers. Washington, D.C.: 1979.

**299. U.S. General Accounting Office. Asbestos in Schools: A Dilemma. Washington, D.C.: U.S. General Accounting Office, Aug 1982. 49p. Available ERIC. ED 223 461.

Asbestos, a mineral known to cause cancer in humans, is present in an unknown number of schools where it may be hazardous to the health of students and employees. Although the Federal Government has programs designed to address the asbestos situation, it has not determined in what specific circumstances asbestos is a hazard. Therefore, state and local school officials currently face a dilemma concerning what to do when they find asbestos in their schools. The first chapter of this document discusses the nature and uses of asbestos, health hazards, federal action to address asbestos in schools, and a summary of federal efforts to reduce asbestos in schools. The second chapter discusses Environmental Protection Agency (EPA) actions to address asbestos in schools, focusing on EPA's technical assistance program (indicated to be a limited success), various state and local abatement responses, and EPA inspection and notification rules. The third chapter considers the limited impact of the Asbestos School Hazard Detection and Control Act of 1980, indicating that no loans/grants are available for asbestos detection and control, that asbestos hazard criteria are still lacking, and that state reports and records provide limited information. Appendices include characteristics of State programs to address asbestos in schools and state asbestos program summaries.

300. Westbrook, Edward J. See you in court. American School and University, v56 n5 p14-15 Jan. 1984.

School districts must take legal action now against asbestos producers to recover the cost of asbestos removal from school buildings. State statutes of limitations, if not met, could result in school districts losing the right to recover against manufacturers.

301. Wright, Dorothy. Once and for all. American School and University, v56 n6 p39-40,42 Feb. 1984.

A Connecticut district's stringent asbestos removal and testing program is described, which applies a modified National Institute of Occupational Safety and Health-Occupational Safety and Health Administration (NIOSH-OSHA) test as a standard of acceptable removal.

302. Yeager, L. Dayle, and David Bilbo. Asbestos: a present hazard in education. CEFP Journal, v21 n3 p18-20, May-June 1983.

Explains what asbestos is, how it can be identified, where it has been used in educational facilities, the health hazards, government regulation, how it can be removed, and lists information sources.

COMMUNICABLE DISEASES AND PARASITIC INFESTATIONS

*303. AIDS and the workplace. Selected References, n234, December 1986.

This short bibliography produced by the Princeton University Industrial Relations Section cites 17 documents published during 1985-86 which discuss AIDS as an employment issue. References dealing with legislation, discrimination, education, legal rights and responsibilities, and policy development are included.

*304. AIDS victims should be allowed in schools. Canadian School Executive, v6 n4 p33, Oct. 1986. Also, AIDS guidelines set. Saskatchewan Bulletin, v53, n1 p1, Aug. 29, 1986.

Describes the guidelines set for schools and daycare centers by the Saskatchewan Advisory Committee on AIDS. The Committee recommends that AIDS victims continue to work or attend school and that isolation occur only on the advice of a doctor or community health officer.

305. Allensworth, Diane DeMuth. Common intestinal parasitic infections in the school-age population. Journal of School Health, v45 n6 p331-7, June 1975.

This article discusses the following common intestinal parasites: a) roundworm; b) pinworm; c) hookworm; d) threadworm; e) trichina worm; and f) whipworm.

*306. Attitudes about AIDS. Phi Delta Kappan, v68 n1 p51-52, Sept. 1986.

A recent U.S. Gallup poll found that two-thirds of the survey sample would permit their children to attend school with a student who had AIDS. Only 6% of those surveyed mistakenly believed that a person could contact AIDS merely by being in a public place with someone who has it.

*307. Baker, Janet. A.I.D.S. Everything You Must Know About Acquired Immune Deficiency Syndrome; The Killer Epidemic of the 80's. Saratoga, CA: R & E Publishers, 1983.

In a clear, concise format, the author presents an extensive chronology of the understanding of AIDS and its impact. Current speculations about etiology, transmissibility and present treatment regimens are included.

308. Bertolini, R. *Acquired Immune Deficiency Syndrome, AIDS - A Summary of Occupational Health Concerns*. Hamilton: Canadian Centre for Occupational Health and Safety, 1986.

309. Bertolini, R. *Syndrome d'immunodéficience acquise, SIDA - Préoccupations liées a l'hygiène au travail*. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1986.

310. Billstein, Stephan. Diagnosis and treatment of lice. *Journal of School Health*, v47 n6 p356-57, June 1977.

When an infestation of lice is identified, medical treatment is effective in clearing up the problem.

311. Bryan, Arthur H. Band wind instrument mouthpieces may harbor countless disease viruses and bacterial flora. *Science Education*, v53 n5 p377-380, Dec. 1969.

Presents the procedures, results, and conclusions of a study designed to determine (a) the amount and kind of microorganisms present on the uncleaned mouthpieces of band wind instruments and (b) the preventive measures that may be taken to destroy the microorganisms. Considers oral hygiene a must for all wind instrument players.

312. Califano, Joseph A., Jr. Warning: your classroom may be dangerous to your health. *Teacher*, v95 n6 p20-34, Feb. 1978.

The United States Secretary of Health, Education and Welfare discusses the national need to ensure that all children are immunized against childhood diseases -- polio, measles, rubella, mumps, diphtheria, pertussis and tetanus.

**313. California State Dept. of Education. *Techniques for Preventing the Spread of Infectious Diseases*. Sacramento: California State Dept. of Education, 1983. 18p. Available ERIC. ED 238 859. Microfiche only.

Specific procedures are outlined for prevention of the spread of infectious diseases with techniques of handwashing, diapering, and handling of known disease carriers. Protocols for classroom cleanliness list essential steps and key points and precautions for maintaining a hygienic environment. This section includes a list of protocols for food handling. It is pointed out that the transmission of infectious diseases may occur more readily in special centers for severely handicapped children because of the close personal contact required for care. Appendices include information on legal requirements, cleaning schedules, selection of disinfectants, and descriptions of contagious diseases.

*314. Canadian Union of Public Employees. Ottawa Carleton District Council and CUPE National Health and Safety Department = Conseil du district Ottawa-Carleton du SCFP et du Service d'hygiène et de la sécurité du Bureau national du SCFP. Treating Head Lice Safely Without Kwellada Shampoo = Traitons les poux sans dangers, non au shampooing Kwellada. Ottawa: CUPE District Council, c.1987.

This report documents recent research identifying lindane, the common name for benzene hexachloride (BHC), as a possible carcinogen and neurotoxin. Kwellada, a shampoo recommended by the Ottawa-Carleton Regional Health Unit for the control of head lice, contains a solution of 1% lindane. Children infected with lice are currently sent home from school with a sheet of instructions including directions on how Kwellada should be applied. This report recommends that the federal government ban the use of lindane. Other strategies for the effective control of head lice are presented. = Ce rapport présente les résultats d'une récente recherche indiquant que le lindane, nom commun de l'hexachloro-gamma benzène, pourrait être carcinogène et neuro-toxique. Le shampooing Kwellada, que recommande l'Unité sanitaire régionale d'Ottawa-Carleton pour l'élimination des poux dans les cheveux sont actuellement renvoyés de l'école avec une feuille comportant entre autres des instructions pour le traitement au shampooing Kwellada. Le rapport recommande d'exhorter le gouvernement fédéral d'interdire l'usage du lindane. Il présente d'autres moyens efficaces de lutte contre les poux.

**315. Center for Disease Control. Education and Foster Care of Children Infected with Human T-Lymphotropic Virus Type III/Lymphadenopathy-Associated Virus. Atlanta, Ga.: Center for Disease Control, 1985. 6p. Available ERIC. ED 262 529.

The guidelines center on education and foster care of children with AIDS (Acquired Immune Deficiency Syndrome). Background information touches on the scope of the problem, legal issues involved, and confidentiality issues. Discussion of risks examines the risk of transmission in the school, day care, or foster setting and notes that casual contact among school children appears to pose no risk, although studies are very limited concerning younger children and neurologically handicapped children who lack control of their body secretions. Risks for children with the disease are also considered. A series of 11 recommendations are made, including the following observations: (1) that for most infected school-age children, benefits of an unrestricted setting would outweigh both the risks of their acquiring potentially harmful infections in the setting and the apparent nonexistent risk of transmitting AIDS; and (2) that for infected preschoolers and some neurologically handicapped children who lack control of their body secretions or who display behavior such as biting and who have uncoverable lesions, a more restricted environment is advisable until more is known about transmission in those settings.

**316. Center for Disease Control. Immunization. Survey of Recent Research. Number Three. Atlanta, GA.: Center for Disease Control (DHHS/PHS), Dec. 1984. 166p. Available ERIC. ED 255 525.

A survey is presented of recently published periodical literature in the field of vaccine-preventable diseases. Information is provided on writings about measles, rubella, influenza, diphtheria-pertussis-tetanus, and other vaccine-preventable diseases. For each disease general information is covered, as well as clinical and laboratory information, epidemiology, and prevention and control. A selected bibliography accompanies each section. Abstracts are included of the most significant articles. Abstracts are also provided of writings on vaccines, antiviral agents, and toxoids, as well as general articles on immunization and health care delivery.

*317. Comité consultatif national sur le SIDA. Lignes directrices à l'intention des personnes responsables de garderies ou de classes où il y a des enfants infectés par le HTLV-III/LAV. Rapport hebdomadaire des maladies au Canada, v12-16 p67-70, le 19 avril, 1986.

Les présentes recommandations résultant de discussions tenues avec divers conseils scolaires préoccupés par cette question, et ont pour but de fournir des conseils de base aux personnes qui sont appelées à s'occuper quotidiennement, en garderie ou en milieu scolaire, d'enfants infectés par le virus associé au SIDA (soit, le HTLV-III/LAV). On veut surtout savoir si l'enfant infecté par le virus peut contaminer ses petits camarades et le personnel enseignant et, le cas échéant, dans quelles circonstances cela risque de se produire.

318. Cowell, Susan. AIDS and community health issues. Journal of American College Health, v33 n6 p253-58, June 1985.

Fear of contracting AIDS has exaggerated the feeling of isolation that AIDS patients experience. This article discusses issues surrounding the spread of AIDS and provides information to deal with AIDS as a health issue, instead of a moral or religious one.

**319. Crosson, James E. Infectious Disease and the Public Schools. Des Moines, Iowa.: Drake Univ., Mountain Plains Regional Resource Center. May 1985 15p. Available ERIC. ED 262 553.

The paper examines policy options for schools regarding appropriate services for children with highly communicable, potentially life threatening diseases such as Acquired Immune Deficiency Syndrome (AIDS) and Herpes. Briefly considered are the school's legal responsibility, implied risk and liability, and actual risk and its control. General recommendations for management of all infectious diseases are offered. Specific recommendations are given for control of AIDS transmission, Hepatitis-B transmission, Herpes transmission, and Cytamegalovirus transmission. Also discussed are the public relations aspects of infectious disease in the public schools, and cost considerations, especially legal costs and liability insurance. It is concluded that the greatest risk at the present time is the potential for legal action on the part of school employees and parents of susceptible children. Schools are encouraged to implement procedures and face the associated risks in the interest of assuring each child's right to an education.

320. Crowder, Marietta. Current school health programs. Journal of School Health, v45 n6 p346-8, June 1975.

This article urges greater awareness of parasitic infestations and describes a Texas school district's program designed to "deworm" a community.

321. Delaney, Patricia A. Skin Infections. Grade Teacher, v89 n5 p22,26, Jan. 1972.

The proper way to deal with a child in the classroom who has a skin infection is discussed.

**322. Doi, Lorraine. Information and Guidelines for Identification of Children with Parasitic Intestinal Infections. Honolulu: Hawaii State Dept. of Education, Office of Instructional Services. Feb 1979. 39p. Available ERIC. ED 196 545.

This report presents (1) information on the incidence, causes, development, transmission, control and prevention of parasitic infections and (2) a report of how Hawaiian Follow Through

Students infected by parasites were identified and provided with treatment. The students were enrolled in kindergarten through third grade classes at three elementary schools. Three of the 27 children screened had parasitic intestinal diseases. Two additional cases may have escaped detection. Also included in this report are descriptions of the procedures developed for contacting parents, teachers and children, collecting stool specimens, and providing follow-up services. It is noted that children with infections may show signs of poor motor coordination, restlessness, inability to sit still and inability to focus on school work. Parasitic intestinal infections can affect how children learn and perform in school. A teacher's health observation form, a chart summarizing the data of the study and a stool specimen collection memo to parents are appended.

323. Foutes, James A., and others. Policy decisions in scabies control. Journal of School Health, v51 n10 p673-75, Dec. 1981.

In a Kansas elementary school, an outbreak of scabies was discovered by the school nurse. Through cooperative planning with the local health department, the infected children were excluded from school pending medical treatment, and a screening program was set up for the entire student population.

324. Harlin, Vivian K. Role of other school health team members. Journal of School Health, v47 n6 p360-62, June 1977.

The school personnel, including the nurse and physician, should work as a team with students' parents when faced with an epidemic of lice in the school.

325. Hickson, Meredith Ann, and Alan R. Hinman. Here's how you can carry on the fight against epidemics in your schools. American School Board Journal, v170 n9 p40-41, Sept. 1983.

During the 1970's many children lacked immunization against one or more of the major childhood diseases. Recently the number of cases of childhood diseases has declined dramatically. The schools are the focal point for disease prevention. Outlined are 10 steps to continue to ensure childrens' health.

326. Highberger, Ruth, and Mary Boynton. Preventing illness in infant/toddler day care. Young Children, v38 n3 p3-8, March 1983.

Describes some of the precautions that should be used regularly by day care staff in order to prevent illnesses in group care programs for infants and toddlers.

*327. Kaus, Danek S., and Robert D. Reed. AIDS - Your Child and the Schools. Saratoga, Ca.: R & E Research, 1986. 24p.

This small extensive guide has been written to help dispell some of the hysteria surrounding AIDS, while at the same time giving parents the information they need to help protect their children. The authors have compiled all the available research into a concise and readable format.

328. Kendall, Earline D. Research in review. Child care and disease: what is the link? Young Children, v38 n5 p68-77, July 1983.

Briefly reviews current research in the United States on hepatitis, some diarrheal diseases, and infections caused by H-flu, suggesting that group care (especially when not carefully monitored) presents risks for very young children, care providers, families, and the community.

329. Lynch, Annette. There is no health in school health. Journal of School Health, v47 n7 p410-13, Sept. 1977.

The major problem in school health revolves around the issue of poor communication between health professionals and educators and a limited view of the wide scope of the health needs of children.

330. Macdonough, Georgia P. School health -- 1977. Journal of School Health, v47 n7 p425-8, Sept. 1977.

This article presents an overview of the current state of public health services in the schools and communities in the United States.

*331. McCormick, Kathleen. AIDS: Sound policies are your best protection. American School Board Journal, v173 n5 pp. 36-37, May 1986.

The message emphasized repeatedly at a conference on AIDS sponsored by the National School Boards Association was that the risk of becoming infected with AIDS is no greater in school than anywhere else. There has been no known case of infection by casual contact. It was recommended that board members: (1) develop a policy on AIDS; (2) adopt guidelines; (3) educate teachers and parents on AIDS and its prevention;

(4) educate children about the disease; and (5) take a leadership role in telling the community about how schools would handle a student or staff member with AIDS.

*332. McCormick, Kathleen. Federal cuts in vaccination funding endanger kids and put you on the spot. American School Board Journal, v169 n8 p30-32,38, Aug. 1982.

Discusses federal cuts in immunization programs and the probable consequences.

**333. Milham, S., Jr. Hodgkin's disease as an occupational disease of schoolteachers. The New England Journal of Medicine, v290 n23 p1329, June 6, 1974. NIOSH-00025191.

According to the data presented in a letter to the editor, the mortality rate of Hodgkin's disease among school teachers in the State of Washington is significantly higher than that for all occupations, and increases with age. The results support the hypothesis that Hodgkin's disease may be horizontally transmitted.

334. Mortimer, Edward A., Jr. Immunization against infectious disease. Science, v200 n4344 p902-7, May 1978.

The success of present and future immunization programs is endangered by public and physician complacency and by complex legal and ethical problems related to informed consent and responsibility for rare, vaccine-related injury.

335. Most, Harry. The epidemiology of common intestinal helminths. Journal of School Health, v45 n6 p343-5, June 1975.

This article discusses the two most frequently found intestinal helminths: tapeworms and roundworms.

*336. National Advisory Committee on AIDS. Guidelines for those responsible for day care and education of chilren with HTLV-III/LAV infection. Canada Diseases Weekly Report, v12 n16 p67-70, April 19, 1986.

This article contains recommendations developed by the NAC-AIDS following discussions with Boards of Education on issues of concern. They are intended to provide guidance to persons involved in the daily care and education of children who have been infected with the virus that causes AIDS (HTLV-III/LAV). The issues of concern are whether the child with HTLV-III/LAV infection can transmit the infection to classmates and staff and under what circumstances transmission is likely to occur.

*337. National Education Association. AIDS in the Public Schools. Washington: unpublished, 1985. v.p.

This set of background documents on the legal, educational, medical, public relations and other related issues surrounding the education of children with contagious/communicable diseases was compiled by the NEA office to assist the Association in setting policy guidelines for its members in dealing with cases of AIDS in the schools. After summarizing the known facts about AIDS, the paper discusses (1) whether and under what circumstances a child with AIDS should be allowed to attend school; (2) whether and under what circumstances a school employee could be compelled to provide instruction and other services to a child with AIDS; and (3) whether and under what circumstances a school district could terminate or transfer and AIDS-infected employee, require current and/or potential employees to be tested for AIDS, or require job applicants to answer questions about current or past sexual conduct. Documents providing facts about AIDS from the federal centers for Disease Control (CDC), CDC recommended guidelines for admission of AIDS-infected children to schools and State of Connecticut guidelines for prevention of AIDS transmission in schools are also included.

*338. NEA issues guidelines for dealing with AIDS in the schools. Link, v10 n3 p4-5, Feb-Apr 1986.

This article presents guidelines for dealing with AIDS adopted by the National Education Association and recommended to affiliates for use in schools, colleges and universities. The guidelines include whether and under what circumstances (1) students or school employees who have or could transmit AIDS should be permitted to remain in the school setting; (2) a school employer should be able to require a student or school employee to be tested for AIDS; (3) a school employee should be required to teach or provide other personal contact services to an AIDS infected student; and (4) information about the condition of an AIDS infected student or school employee should be made available to others.

**339. New York State Education Dept. Immunization: A Handbook for Schools. Vaccine-Preventable Communicable Disease Control. Second Edition. Albany: New York State Education Dept., Bureau of School

Health Education and Services. 1982 45p. Available ERIC. ED 222 457.

This handbook was developed by the Bureau of School Health Education and Services of the New York State Education Department to provide school authorities with a guide for an effective school immunization program. It offers direction for local development of immunization policies and procedures, an overview of effective program activities, a glossary, and answers to the most frequently asked questions about immunization. The appendices include the New York State Department of Health "Immunization Guidelines" (September 1981), excerpts from legislative mandates and court decisions pertaining to immunization, and sample forms for student exemption and transfer.

*340. Ontario. Ministry of Health. AIDS. (Fact sheets). Toronto: Ontario Queen's Printer, 1986. v.p.

A series of fact sheets on AIDS are available from the Ontario Health Information Center. Leaflets of 2-4 pages on the following topics may be requested: Information about AIDS: Information for parents and teachers; Detecting AIDS; Women and AIDS; AIDS and the Workplace; AIDS and health care workers.

341. Paskert, Catherine J. Progress and focus of the national childhood immunization campaign. Journal of School Health, v53 n6 p357-59, Aug 1983.

A nationwide campaign to improve and maintain immunization levels for selected preventable childhood diseases was instituted in 1977, and another program, whose goal was to eliminate indigenous measles by 1982, was instituted in 1978. Immunization levels have improved so much that attention is now focused on ways to maintain these high levels.

342. Preblud, Stephen R., and others. An evaluation of the United States rubella immunization program. American Annals of the Deaf, v125 n8 p968-76 Nov. 1980.

While the United States rubella immunization program has controlled epidemic rubella, endemic rubella activity still occurs and affects primarily adolescents and young adults.

343. Price, James H., and others. High school students' perceptions and misperceptions of AIDS. Journal of School Health, v55 n3 p107-09, March 1985.

The knowledge, beliefs, and sources of information of high school students concerning AIDS were examined. Results are discussed.

*344. Priegert, Portia. Aids in the workplace: how one office replaced fear with understanding. Hamilton Spectator, Feb. 5, 1986.

An education program was devised by managers to help employees cope with the knowledge that one among them carried the AIDS virus. The program and its effects are discussed.

**345. Reid, D.D. Environmental factors in respiratory disease. The Lancet, n274 p1237-1242, June 1958. NIOSH-00012049.

Description of various sources of respiratory infection. Discussion is made of the home as a focus of respiratory infection, family status in the introduction and spread of family infections, home and school sources of throat infections, spread of infections in classrooms and experiments in air hygiene in schools. Neither bacteriological investigations nor clinical field studies are considered capable of revealing the ultimate secrets of the epidemiology of infectious diseases such as the common cold.

**346. Riley, E.C. The role of ventilation in the spread of measles in an elementary school. Annals of the New York Academy of Sciences, v353, p25-34, 1980. NIOSH-00114707.

The role of ventilation systems in the dissemination mechanisms of measles in an elementary school was studied. The pattern of epidemic spread was studied in an elementary school which had reported a measles outbreak. The study population consisted of 868 children of whom 97 percent had been vaccinated against measles. After the second grade index case became ill and was removed from school, 28 susceptibles were infected, 2 from the homeroom and 26 in 13 other classrooms served by the same ventilation system. Although the first infected child normally walked to school, 52 of the 60 other affected children rode school buses. There were three major exposure sites: classrooms with infectors; other classrooms served by the same ventilating system; and school buses with infectors. These sites provided the greatest opportunity for infection and together determined the observed epidemic pattern. The authors concludes that the basic factors for all possible exposures of all susceptible subjects may never be accurately measured. Mathematical models can accept all quantifiable risks of infection and provide a rational basis for computer simulations of patterns of airborne contagion.

347. Riley, E.C., G. Murphy and R.L. Riley. Airborne spread of measles in a suburban elementary school. American Journal of Epidemiology, v107 n5 p421-432, 1978.

A measles epidemic in a modern suburban elementary school in upstate New York in Spring, 1974 is analyzed in terms of a model which provides a basis for apportioning the chance of infection from classmates sharing the same homeroom, from airborne organisms recirculated by the ventilating system, and from exposure in school buses. The epidemic was notable because of its explosive nature and its occurrence in a school where 97% of the children had been vaccinated. Many had been vaccinated at less than one year of age. The index case was a girl in second grade who produced 28 secondary cases in 14 different classrooms. Organisms recirculated by the ventilating system were strongly implicated. After two subsequent generations, 60 children had been infected, and the epidemic subsided. From estimates of major physical and biologic factors, it was possible to calculate that the index case produced approx. 93 units of airborne infection per minute. The exceptional infectiousness of the index case, inadequate immunization of many of the children, and the high percentage of air recirculated throughout the school, are believed to account for the extent and sharpness of the outbreak.

348. Sacks, Jeffrey J., and others. Epidemiology of a tuberculosis outbreak in a South Carolina junior high school. American Journal of Public Health, v75 n4 p361-65, April 1985.

Presents a case study of a tuberculosis outbreak in which a rural South Carolina seventh-grade student with infectious cavitary, pulmonary tuberculosis was implicated as the source of infections in 40 percent of the junior high-school student body.

**349. Sever, John L. Infectious Diseases and Immunizations. Matrix No. 13. (Paper presented at the Research Forum on Children and Youth, Washington, DC, May 18-19, 1981). Washington, D.C.: Administration for Children, Youth, and Families (DHHS), Jan 1982. 16p. Available ERIC. ED 214 637.

This paper summarizes the major advances achieved by research in the fields of infectious diseases and immunizations during the 1970s, and delineates directions for future research in these fields.

350. Shookhoff, Howard B. Treatment of intestinal roundworm infections. Journal of School Health, v45 n6 p339-42, June 1975.

351. Silva, Richard J. Hepatitis and the need for adequate standards in federally supported day care. Child Welfare, v59 n7 p387-400, July-Aug. 1980.

This article examines findings in three epidemiological studies of day care centers and concludes that higher standards of care can reduce the incidence of hepatitis among parents and staff.

352. Sinacore, John S. Assistance by state departments of education to local school districts. Journal of School Health, v45 n6 p349-50, June 1975.

This article urges broad-scale education programs enlisting the parents, teacher training institutions, and state departments of education in the fight against nematode infestation.

353. Slonka, Gerald F. Life cycle and biology of lice. Journal of School Health, v47 n6 p349-51, June 1977.

There has been an increase in the incidence of pediculosis which is in part attributed to misunderstanding and ignorance about the life and biology of lice.

**354. Stead, W.W. Control of tuberculosis in institutions. Chest, v76 n6 p797-800, Dec. 1979. NIOSH-00093419.

The incidence and control of tuberculosis (TB) in institutional settings are discussed. Surveys and study results concerning TB prevalence in state prisons, nursing homes, mental hospitals, and schools for retarded people are reviewed. Control guidelines are suggested for each type of institution. The author notes that an effective control program must be tailored to the individual needs and conditions of the institution. Careful screening of new admissions and employees is probably the best control technique.

355. Strangert, Katherine. Respiratory illness in preschool children with different forms of day care. Pediatrics, v57 n2 p191-6, Feb. 1976.

356. Sullivan, Peggy, and others. Longitudinal study of occurrence of diarrheal disease in day care centers. American Journal of Public Health, v74 n9 p987-91, Sept. 1984.

Among 60 day care centers surveyed, characteristics of centers with high rates of disease among children included (1) the presence of young, nonbowel trained children, (2) staff who both regularly diapered infants and prepared food, (3) for-profit management, and (4) centers whose only guidelines were provided by the state.

*357. Surgeon General's Report on Acquired Immune Deficiency Syndrome. Washington, D.C.: U.S. Department of Health and Human Services, 1986. 36p.

Written for the general public, this report explains and illustrates the known facts about the transmission and prevention of AIDS. It stresses the responsibility of every citizen to be informed about AIDS and to exercise appropriate preventative measures.

358. Thompson, Virginia M. Role of the school nurse. Journal of School Health, v47 n6 p358-59, June 1977.

The nurse is the chief epidemiologist in each school. It is her responsibility to search for any possible source of infestation of lice in the school setting.

**359. Vianna, N.J. Epidemiology of Hodgkin's disease: review and etiologic leads. CRC Critical Reviews in Clinical Laboratory Sciences, v5 n3 p245-287, Jan.1975. NIOSH-00050944.

Evidence derived from a variety of epidemiologic studies suggests that environmental factors are important in the etiology of Hodgkin's disease. Genetic factors may influence susceptibility to the disease and host reactivity as determined by the four histologic subtypes. Topics reviewed in detail include: classification of Hodgkin's disease; age and sex distribution; international comparisons; ethnic, religious, occupational and social factors; urban-rural differences; migration studies; seasonability in Hodgkin's disease; time-space clustering; possible identification of individuals susceptible to the disease; possible infectious etiology of the disease. Reference is made to the fact that available evidence suggests that Hodgkin's disease is more frequent among workers employed in the wood industry, among male high school teachers, and among physicians in upstate New York.

**360. Vodopija, I. Hodgkin's disease - a chronic infection? Medical Journal, National Library of Medicine, (Lijecnicki Vjesnik, v93 n3 p360-362, 1971), Washington, D.C., p.67-69, 1972. NIOSH-00017914.

Review of the incidence of Hodgkin's disease in a Albany high school class located through the New York Tumor Register by Vianna and associates. The pattern of appearance of the disease among former high school pupils suggests that Hodgkin's disease is of an infectious nature with an incubation period lasting a number of years, and that it sometimes might be transmitted by germ carriers.

*361. Wadelius, Vaughn. Acquired Immune Deficiency Syndrome in the Public School; A Position Paper. Winnipeg: Manitoba Teachers' Society, 1985. v.p.

This paper focusses on the circumstances that affect students and teachers with the advent of the disease, known as Acquired Immune Deficiency Syndrome, or AIDS. Three issues are considered: (1) Whether and under what circumstances should children with AIDS be allowed to attend public schools, (2) Whether and under what circumstances should teachers (or other school employees) be required to teach or provide services to children with AIDS, and (3) Whether and under what circumstances should teachers (or other school employees) with AIDS be subject to transfer or suspension with pay.

**362. Williams, R.R., N.L. Stegens, and J.R. Goldsmith. Associations of cancer site and type with occupation and industry from the third National Cancer Survey Interview. Journal of the National Cancer Institute, v59 n4 p1147-1185, Oct. 1977. NIOSH-00074161.

From the Third National Cancer Survey (TNCS) Interview Study of 7,518 incident cases, lifetime histories of occupations and industries were studied for associations with specific cancer sites and types while controlling for age, sex, race, education, use of cigarettes or alcohol, and geographic location. Lung cancer patients were found more often than expected among several categories including trucking, air transportation, wholesaling, painting, building construction, building maintenance, and manufacturing. Controlling for cigarette smoking did not change these associations. Leukemia and multiple myeloma were associated with sales personnel of both sexes, whereas lymphomas and Hodgkin's disease were excessive among women working in the medical industry. Other associations included rectal cancer with several retail industries; prostate cancer with ministers, farmers, plumbers, and coal miners; malignant melanoma with school teachers; and invasive cervical cancer with women working in hotels and restaurants. Breast cancer patients were more common among women who were teachers or other professionals and who worked in business and finance (even after controlling for education). Many other findings are presented in detailed tables. Results are reported mainly as a research resource for use by other investigators doing work in this field. Suggestions are given for future studies.

DUPLICATING MACHINES

**363. Apol, A.G., L. Frederick, and P.A. Shulte. Health Hazard Evaluation Technical Assistance Report No. TA-80-32. Cincinnati, Ohio: Division of Surveillance, Hazard Evaluations and Field Studies, National Institute for Occupational Safety and Health. 16p. June 1980. NIOSH-00098088.

Environmental sampling and medical surveys were conducted between February 5 and 15, 1980 at 12 schools using spirit duplicating equipment in the Everett School District of Washington. The evaluation request came from an authorized representative of the Public School Employees of Washington to determine if a methyl-alcohol exposure hazard existed for the district's 84 teacher aides and if the deaths of three former teacher's aides were related to exposure. The 15 minute methyl-alcohol air concentration from 20 duplicators with no local exhaust ventilation ranged from 365 to 3,080 parts per million (ppm). The NIOSH recommended standard of 800ppm for a 15 minute period was exceeded in 15 of the 20 measurements. When 11 local exhaust ventilation systems were put in operation, concentrations ranged from 80 to 1,340ppm with only one measurement exceeding 800ppm. Additional exposures reduced concentrations to a range of 9 to 130ppm. The questionnaire survey revealed that 45 percent of the teacher's aides experienced some symptoms consistent with methyl-alcohol toxicity. Review of the death certificates and autopsy information of the three deceased aides gave no indication that their deaths were related to methyl-alcohol exposure. The authors note that 75 percent of the spirit duplicating machines tested exceeded the methyl-alcohol exposure limits recommended by NIOSH, but that simple engineering controls were available to reduce these exposures.

364. Halton, David M. Occupational Exposures from Spirit-Duplicator Operations. Hamilton: Canadian Centre for Occupational Health & Safety, October 1983.

The current technology used in spirit duplicating is discussed. A number of studies have indicated the potential for methanol overexposure from these machines. These are described here, along with the negative health effects. The various exposure-control strategies are reviewed.

365. Halton, David M. Photocopiers: Do They Pose a Health Hazard. Hamilton: Canadian Centre for Occupational Health and Safety, 1983.

366. Halton, David M. Photocopieurs: présentents-ils des dangers pour la santé. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1983.

367. Halton, David M. Risques auxquels s'exposent les travailleurs qui emploient un duplicateur à alcool. Hamilton: Centre canadien d'nygiène et de sécurité au travail, 1984.

Document sur la technologie actuellement utilisée dans l'utilisation des duplicateurs à alcool. Un certain nombre d'études ont signalé le risque de surexposition au méthanol que dégagent ces machines. La publication contient une description des duplicateurs ainsi que des effets nocifs pour la santé. On y passe en revue diverses mesures de contrôle de l'exposition.

**368. McManus, K. P. Health Hazard Evaluation Report, No. HETA-82-372-1220, Indian Brook Elementary School, Plymouth, Massachusetts. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health. November 1982. 11 p. NIOSH-00127556.

Worker exposures to methyl-alcohol from the use of spirit duplicators were investigated on September 30, 1982 at the Indian Brook Elementary School in Plymouth, Massachusetts. The survey was requested by the Plymouth School Committee on behalf of an unspecified number of teachers and staff. Breathing zone and general area air samples were collected in the teachers' lounge while the two duplicator machines were operating. Air flow was also measured. Breathing zone samples contained more than 3000 parts per million (ppm) methyl-alcohol after 35 copies were run. After 3 minutes of duplicator operation, general air samples contained about 500ppm. The NIOSH exposure standard is 800ppm for a 15 minute period. The ventilation system did not provide sufficient fresh air flow. The author concludes that hazardous methyl-alcohol exposure exists after only 4 minutes of duplicator operation. Handling of fresh copies can add to exposure via skin absorption. The author recommends improved ventilation, and a drying of copies before they are handled.

**369. Pryor, P. Health Hazard Evaluation Report No. HETA-81-305-961, Aurora Schools, Aurora, Colorado. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health. October 1981. 10p. NIOSH-00119691.

Environmental and personal air samples were analyzed for methyl-alcohol at the East Middle School in Aurora, Colorado, on June 19, 1981. A representative of the Aurora Schools requested the evaluation for an unspecified number of workers. Medical questionnaires were also administered to an unspecified number of affected workers. Time weighted average concentrations of methyl-alcohol ranged from 396.0 to 640.0 milligrams per cubic meter (mg/cum) compared with the OSHA standard of 260mg/cum. Methyl-alcohol concentrations ranging from 968.0 to 1400.0mg/cum were collected during 15 minute sampling periods. All medical questionnaire respondents reported some adverse health symptoms including blurred vision, headaches, nose burning, sluggishness, dizziness, sore throat, dermatitis, chest tightness, and depression. The author concludes that a health hazard from exposure to methyl-alcohol existed at this facility. He recommends provisions of local exhaust ventilation, aeration of newly duplicated paper, use of rubber gloves, good personal hygiene, and other ventilation modifications to reduce methyl-alcohol exposure from the duplicating fluids.

370. Women's Occupational Health Resource Centre. Popular duplicating machines can cause adverse effects. Women's Occupational Health Resource Centre, June/July 1984, p2.

Small offices and schools are exposing employees, especially teacher's aides, to health hazards associated with overexposure to methyl alcohol in confined spaces. Symptoms include headaches, dizziness, nausea, blurring of vision, behavioural disturbances.

*371. Zalnieriunas, Vida. Methanol: health hazard in schools. Reporter, v10 n1 p28+, Oct. 1984.

In a recent safety memorandum, the Ontario Ministry of Education discusses the hazards of spirit duplicators. Good ventilation is strongly recommended. Dittos must now be aired for 24 hours before they are handed out to students. As of Dec. 16, 1983 the Ontario Ministry of Labour ordered a ban on the use of methanol throughout the Ottawa Board of Education following tests that showed excess methanol vapour in various schools. The Ontario English Catholic Teachers' Association has asked that government subsidies be given to school boards to make the transition to photocopiers over a period of two years.

FURNITURE

**372. Burr, Donald F. What School Furniture Will Look Like Tomorrow. Paper presented at American Association of School Administrators Annual 103rd Convention. Atlantic City, N.J.: Feb., 1971. 16p. Available ERIC. ED 048 668.

The school furniture of tomorrow will be formed and shaped by design analysis of the learning process rather than by a discipline or maintenance function design. Three of the most significant characteristics of future school furniture will be multiple use, flexibility, and mobility. An interior componentized system will provide spaces for work and study, divide spaces, create atmospheres, and store items. Some anticipated furnishings are: acoustical noise-absorbing furniture, electric carpets to send electrical power supplies and/or audio visual signals throughout a building, screens capable of carrying internal electrical power, and movable library stack units.

373. Department of Education and Science. School Furniture Dimensions: Standing and Reaching. London, England: Department of Education and Science, 1967. 36p.

Performance of school children in regard to their standing and reach postures are described with dimensions given on the limits of their performance only. The facts of task performances are presented for the following tasks -- (1) seeing into a shelf, (2) reaching into a shelf, (3) drawing on a vertical surface, (4) sitting or standing while performing a task at a work surface, and (5) working at a bench. Testing conditions and methods used in gathering criteria are given. Dimensional limits of school children are indicated and can be used in the design of educational equipment. Diagrams, scales and charts are included.

374. Eby, C.L. and R.L. Jetton. School desk dermatitis. Archives of Dermatology, v105 p890-891, June 1972. NIOSH-00017985.

Case report of a patient with a primary irritant contact dermatitis to fiberglass. This is thought to be the first reported case in which the suspected source of contact is fiberglass-reinforced plastic chairs. Histories of exposure and sensitivity are discussed, as well as successful treatment with triamcinolone diacetate.

**375. Floyd, W. F., and J. S. Ward. Anthropometric and physiological considerations in school, office and factory setting. Ergonomics, v12 n2 p132-139, March 1969. NIOSH-00009789.

Anthropometric data and analyses of the behavior of schoolchildren with the multimoment technique during lessons are the basis for the considerations of the problems of school, office, and factory seats. Characteristic postures of schoolchildren are: trunk straight, shoulders straight, legs straight, trunk supported by arms, and backrest used. The backrest was used about 50% of the time in traditional furniture, and about 60% of the time with new furniture. The most frequent sitting behavior was a desk-supported posture. With one school child myograms were recorded in the characteristic sitting posture. The lowest electrical activity occurred when the backrest was used. Results of preliminary findings suggest further studies in myography may be valuable in determining postural behavior, in addition to basic anthropometric requirements, that should be considered in the dimensions and design of seats and chairs.

*376. Furniture and furnishings for the open plan. School Management, v15 n3 p16-19, March 1971.

The latest developments in school buildings challenge designers of school equipment.

*377. Helmuth, Hermann. Seats, desks and students. Orbit, v13 n1 p25-26, Feb. 1982.

Significant changes in the last 30 years in average height of children have implications for the design of the seats and desks that constitute the children's workplace. Through tables and figures, data are presented for making chairs and desks comfortable and efficient. Improper sitting habits are also discussed.

**378. Mandal, A. C. The seated man (homo sedens). The seated work position. Theory and practice. Applied Ergonomics, v12 n1 p19-26, March 1981. NIOSH-00112380.

The problems associated with the sedentary work position are analyzed. The anatomy of the sitting posture is discussed, as well as the concomitant rotation of the pelvis, and flattening of the lumbar curve. School childrens' work position and the advantage of using a tilting chair are described. Proposals for improving the work position are given.

**379. Oxford, H.W. Anthropometric data for educational chairs. Ergonomics, v12 n2 p140-161, March 1969. NIOSH-00009787.

The article reports on anthropometric studies which showed that schoolchildrens' seats and tables should be in proportion to their bodies. This entailed several sizes in each classroom. In 1949, 5 anthropometric measurements were taken of 13,000 primary and secondary pupils in public schools in New South Wales, Australia, for the purpose of designing school chairs. The survey showed that desks of uniform height in classrooms were unsatisfactory for a large percentage of pupils because of their differences in stature. Since then, every grade in N.S.W. has been supplied with more than one height of seating. Eight sizes of chairs were introduced in 1950 and distributed in various assortments in terms of grade. In 1954, the number of sizes was reduced from 8 to 6, ranging in seat height from 10 in. (260 mm) to 17 1/2 in. (445 mm) at 1 1/2 in. (38 mm) rises, but the number of sizes issued to each class remained the same. In 1965, a more extensive anthropometric survey was conducted to obtain 11 measurements of 12,000 pupils of all grades. Four hundred teachers were included. It was found that nearly all the increase in maximum stature between 1908 and 1965 occurred before school age. After the age of 5, the rate of growth in 1965 was only slightly more than in 1908. Boys and girls reach 95% of maximum stature at the age of 15 and 13 respectively. The most important fact that emerged from both surveys was that pupils differ in size to such an extent that a chair and table satisfactory for one pupil could be quite unsatisfactory for another in the same class. In 1965, for example, there was a range of 10 cm, 15 cm, and 16.5 cm in the lower-leg measurement of kindergarten, sixth grade and secondary students. Three thousand pupils of all ages in N.S.W. made it clear in 1968 that they did not wish to use chairs of equal height in any classroom. They preferred to sit on chairs equal to the length of the shod-lower-leg, or about 5 mm to 8 mm in excess of it. Their preferences could not be satisfied unless 3 sizes of chairs were supplied in suitable assortments throughout infants and primary schools, and at least 2 sizes were supplied to secondary schools. Eleven percent of first form students, or 4% of all secondary students in 1965 were not as tall as the biggest pupils in the first class of the infants school.

*380. School seating. School Administration, v n p19-21, May 1968.

Criteria for school desks, gymnasium bleechers and study carrels are discussed. A chart indicating distribution of child development by grade along with working surface height and chair height for each stage of development is included. Furniture to accommodate a growing demand for flexibility in education is also discussed.

381. Silver, Francis. More on the plastic problem. Ecologist, p9, 1976.

Many people experience burning sensations, loss of attention and drowsiness when sitting on plastic chairs. It is possible that incidences of misbehaviour by children such as wrecking school buses, hyperactivity and learning difficulties may all be influenced by exposure to tri-cresyl phosphate in the vinyl seating of the buses, school seats or cleaning agents.

INDUSTRIAL ARTS SHOPS

382. Anderson, Jerry. Signs of our times -- make your shop safer. School Shop, v30 n9 p36-37, May 1971.

Some danger areas in the school shop are identified and safety measures described.

383. Band saw and milling. Ontario Industrial Arts Bulletin, v40 n2 p35-36, Winter 1981.

384. Bell, Herbert. Safety check your industrial arts programs. Industrial Arts and Vocational Education, v61 n3 p47,49-50, March 1972.

385. Bender, Michael. A "least restrictive" place for EMRs. School Shop, v37 n8 p63-5, April 1978.

Presenting information intended to aid those who will be responsible for integrating the educable mentally retarded into shop programs, this article discusses population characteristics, physical characteristics, and learning characteristics of the mentally retarded. Interpersonal skills and safety considerations are also discussed in relation to the mentally retarded.

386. Berthelot, Ronald J., and others. Safety and liability. Florida Vocational Journal, v8 n2 p1,6-14, Nov-Dec. 1982.

This series of five articles highlights Pensacola Junior College's occupational safety course, involving simulated emergencies, Florida's standards for teacher liability, electrical safety in the classroom and laboratory, color coding for machine safety, and Florida industrial arts safety instructional materials.

387. Bettis, M.D. Experimental Development and Evaluation of a Shop Safety Attitude Scale. Ph D. thesis, Iowa State University of Science and Technology, 1972. 118p. NIOSH-00090998.

To determine if particular individuals might be prone to have accidents, a shop safety attitude scale was developed and evaluated. Corresponding with this was the purpose of determining the relationship between mechanical aptitude, test scores, and accident experience; between social desirability test scores, and accident scores; between high school rank, cumulative college grade point average, and ACT score and accident experience; between enrollment in Agricultural Engineering 254 or Agricultural Engineering 255, and accident experience; and between age and accident experience. It was found that accident experience cannot be predicted by a combination of two or more independent variables used in this experiment; nor can it be predicted by a written semantic differential attitude scale. It was possible, however, to develop a written shop safety attitude scale that can be used alone or in combination with other instruments to predict certain types of accidents.

388. Bettis, Mervin D., and Harold R. Crawford. Experimental development and evaluation of a shop safety attitude scale. Journal of the American Association of Teacher Educators in Agriculture, v13 n3 p22-28, Nov. 1972.

389. Bonfadini, John E. OSHA's influence on your buying. Industrial Education, v65 n10 p30-32,34-40, Dec. 1976.

A list of major topic headings describing Occupational Safety and Health Act requirements that have some significance for the industrial arts learning environment and possible equipment needs and considerations. A 30-item Laboratory Safety Evaluation Form is included.

**390. California State Dept. of Education. Industrial Education Safety Guide. Sacramento: California State Dept. of Education, 1978. 29p. Available ERIC. ED 159 398. Microfiche only.

California is one of the few states in which school districts have a legal responsibility for accidents involving students while they are participating in assigned school activities. This guide was prepared to help school administrators and teachers evaluate their safety instruction programs and industrial education facilities in accordance with the legal requirements of California's education and government codes and occupational safety and health legislation. The first section of the guide quotes parts of the codes on accident liability and required safety instruction, legal provisions for school eye safety, industrial education work station safety, and legal bases for teacher negligence. A safety instruction program in industrial education is outlined in the second section. The third presents safety requirements applicable to industrial education facilities and equipment from the California Occupational Safety and Health Act, as detailed in general industry safety orders which cover safety requirements for business and industry. A facility safety inspection list is appended.

391. Campbell, Edward A. Strike down haphazard junior high lab planning. Industrial Education, v62 n3 p27, March 1973.

392. Carson, Shawn Thomas. Comparison of the Alberta Occupational Health and Safety Act (1976) and the operational noise exposure levels within the senior high industrial arts laboratories of the Edmonton Public School Board. M. Ed. thesis. University of Alberta, 1979.

This study compared the standard for noise exposure of 85 dBA/8 hour limit, or equivalent, as stated in the regulations of The Alberta Occupational Health and Safety Act (1976) and the operational noise exposure levels in the seven senior high industrial arts laboratories that comprised the population of the research. The findings show that the noise exposure levels in the Electronics and Visual Communications Technology areas were so low, they were considered innocuous. For Power Technology, however, it was found that the noise levels generated could possibly present a hearing safety hazard in some of the laboratories monitored. Further, in two of the five laboratories that offered this technology, the equivalent noise exposure levels were above the 50 percent "level for concern" advocated by the Occupational Hygiene Branch, Alberta Labour, and levels in excess of 115 dBA were reported. The equivalent noise exposure levels for six of the seven schools tested were highest in the Materials Technology area, where noise exposures were extreme. In all six schools, levels in excess of 115 dBA were reported. Because of the high noise level exposures produced in Materials Technology, the existence of a potential hearing hazard, for students and teachers working in this area, seems possible. The research data revealed that none of the staff or students in any of the areas or facilities monitored wore any form of hearing protection whatever. In addition, a majority of the industrial arts teachers who participated in the study, expressed concern over the operational noise levels that existed in their laboratories.

393. Cliffe, Roger. Implementing hearing safety. Journal of Industrial Teacher Education, v15 n3 p69-74, Spring 1978.

Hearing damage from noise exposure and approaches to implementing hearing safety in school industrial laboratories through noise reduction and protective equipment are discussed. Although all states have not adopted the Occupational Safety and Health Act, teachers should be aware of noise hazards and act to protect hearing.

394. Collier, Stephanie, and Rachelle Bruno. Teaching safety skills. A problem solving approach for special needs students. Journal for Vocational Special Needs Education, v7 n1 p15-16,20, Fall 1984.

Describes the use of a problem-solving approach to assist special needs students in conceptualizing safety rules so that safety rule use will be applied in the vocational shop environment.

**395. Connecticut State Dept. of Education. Industrial Arts Curriculum Guide for Safety. Hartford: Connecticut State Dept. of Education, Div. of Vocational Education. May 1981. 268p. Available ERIC. ED 204 629.

This guide is intended to draw attention to the necessity for safety education in every aspect of industrial arts and to provide resources for upgrading and improving safety instruction in the classroom. It also can be used for inservice training of industrial art teachers and for undergraduate teacher education in Connecticut. Introductory materials include a suggested safety education policy statement and discussion of specific guidelines for Industrial Arts. Other materials contained in the guide fall into these 10 categories: Safety Responsibilities, Safety Program Administration, Personal Safety Practices, Safety Practices in Industrial Arts, First Aid, General Building/Shop Electical Wiring, Occupational Safety and Health Act (OSHA) Machine Guarding Requirements, Specific Safety Considerations for Lab Areas (Preventive Maintenance), and Handicapped/Safety. Appended resources for safety instruction, amounting to approximately one-half of the guide, include (1) general information sources regarding OSHA, (2) sample forms for reporting accidents/hazards, (3) sample safety inspection check list, (4) Connecticut Eye Safety Manual, (5) Color Coding for Marking Physical Hazards, and (6) Equipment Instruction Sheets and Evaluation (basic information followup quizzes).

396. Corwin, John K. PMI for electrical safety. School Shop, v31 n8 p68-71, April 1972.

Preventive Maintenance Inspection programs (PMI) for school safety are described in detail.

**397. Dennis, Bill, and David Poston. General Safety Manual for Vocational-Technical Education and Industrial Arts Programs. Bulletin No. 1674. Baton Rouge: Louisiana State Dept. of

Education, Div. of Vocational Education. 1982. 275p. Available ERIC. ED 221 714.

This manual is designed to offer suggestions for teaching safety in Louisiana industrial arts and vocational education programs. The suggestions and information presented are intended for use in an ongoing safety program, not a short unit presented at the beginning of the school year. Following an introduction in unit 1, the material has been broken into eight additional units that address specific considerations necessary to safety in programs. Unit 2 discusses the responsibilities of various persons as they relate to safety, while unit 3 offers suggestions for the development of a safety program that meets the needs of the unique situation in every industrial arts-vocational education laboratory. In unit 4, the instructor's responsibility for teaching students the safe way to perform the various activities in the different industrial and vocational curriculum areas is addressed. Most commonly recommended safety regulations are outlined in unit 5, while unit 6 is devoted to procedures for making safety inspections designed to ascertain if the laboratory is as hazard-free as possible. Recommendations for making advanced preparations for emergencies are the focal point of unit 7. Finally, units 8 and 9 provide a system for recordkeeping and present sample tests for general safety understanding. Transparency masters are provided with many of the units. Appendices contain signs and safety instructions for machines, a list of resources, and supplemental safety instruction packets for automotive, carpentry/woodworking, electricity/electronics, machine shop, small engines, and welding courses.

**398. Dyrenfurth, Michael, and Richard Linhardt. The Development of a Vocational Safety Guide for Missouri's Practitioners. Final Report. Columbia: Missouri Univ., Dept. of Practical Arts and Vocational-Technical Education. June 30, 1981. 42p. Available ERIC. ED 205 767.

A project was conducted to develop a comprehensive vocational education safety guide for local administrators and teachers. Major sections of the guide included Missouri-specific laws, levels of responsibility, liability, safety program recommendations, facilities and equipment, personal protective equipment, and vocational special needs students. In addition, a reference listing of textbooks, articles, and state and national resource agencies was compiled as part of the guide. The project needs assessment is included in the report.

399. Evans, K.L. Noise and Abatement as it Relates to Industrial Education Woodwork Shops. Vancouver: Educational Research Institute of B.C., 1983. 66p. (Report no. 84:4).

400. Featherstone, Fred. Band saw: friend/foe. Ontario Industrial Arts Bulletin. v41 n2 p36-37, Spring 1982.

**401. Firenze, R.J., and J.B. Walters. Safety And Health For Industrial/Vocational Education For Supervisors And Instructors. Cincinnati, Ohio: Division of Training and Manpower Development, National Institute for Occupational Safety and Health, Public Health Service, U.S. Department of Health and Human Services, Report No. PB83-188-128. July 1981. 702p. NIOSH-00135144.

A safety and health course for industrial and vocational education supervisors and instructors is presented. The course is organized into 17 separate units. Units include: impact of accidents on industrial/vocational educational shop programs, organization for safety and health programs, essential processes in hazard control, shop operations hazard analysis, safety committees, accident investigation techniques, safety and health inspection techniques, principles of good shop planning, safe working surfaces, maintenance of industrial/vocational school shops, illumination and color for safety, fire protection, health hazards, personal protective equipment, machine guarding, safety and health considerations in welding and cutting operations, and electrical safety. Each unit is presented in a format consisting of methods, purpose, objectives, special terms, instructor materials, and trainee materials. A question and answer section is provided at the end of each unit. The course is designed as a complete training program for administration over a 3 day period. The primary purposes of the course are to acquaint supervisors and instructors with the characteristics of effective safety and health programs; demonstrate the relationships between hazards encountered in the industrial and vocational shop; provide information on safety and health problem identification and evaluation, inspections, accident investigations, and selection and use of effective hazard controls; and teach participants to differentiate important hazards from those with lesser destructive potential.

402. Gerrish, Howard H. A safety program for electricity and electronics. Industrial Arts and Vocational Education, v59 n3 p115-117, March 1970.

Suggests a safety program for electricity and electronics courses of industrial arts or trade and technical education.

**403. Godbey, F. W. Occupational Safety and Health in Vocational Education: A Guide for Administrators, Faculty, and Staff. Cincinnati, Ohio: Division of Technical Services, National Institute for Occupational Safety and Health, Publication No.79-125, Feb. 1979. 195p. NIOSH-00091501.

A guide is presented for the establishment of occupational safety and health (OSH) programs in schools that include vocational education curricula. Administrative and technical or regulatory guidelines are described, along with a self evaluation instrument for use in making periodic hazard inspections. The administrative guidelines contain information on general characteristics of OSH programs, OSH committees, employee cooperation, emergency plans, OSH maintenance, and the handling of machine and hand tools. The technical or regulatory guidelines review regulatory or general conditions and operations, including walking and working surfaces, ladders, industrial stairs, standard guardrails and toeboards, scaffolds, safety belts, lifelines, lanyards, nets, excavating and trenching, and exits and exit markings. The guidelines also consider occupational health and environmental controls for noise exposure, ventilation, chemical handling, entry to confined spaces, harmful materials and practices, hazardous materials, spray painting, and personal protective equipment. Other topics covered include medical and first aid, fire protection, compressed air equipment, materials handling and storage, machinery and machine guarding, requirements for woodworking equipment, hand and portable powered tools, welding, cutting, brazing, and the National Electric Code.

**404. Graham, Charles D., Ed. Pennsylvania Industrial Arts Safety Guide. Second Edition. Harrisburg: Industrial Arts Association of Pennsylvania.; Pennsylvania State Dept. of Education, Bureau of Vocational and Technical Education. 1981. 224p. Available ERIC. ED 213 953.

Intended to alert industrial arts teachers, teacher educators, school administrators, and industrial arts supervisors to the importance of a strong safety program, this guide provides the instructional resources for instituting safety instruction in the public schools, for the inservice training of industrial arts teachers, and for the education of undergraduates in the teacher education programs in Pennsylvania. The material contained in the guide falls into several categories, including resources, safety information, instructional suggestions, lesson plans, materials for student use, forms and checklists, lists of responsibilities for safety programming, faculty considerations, and teacher liability. Covered in the guide are responsibility, safety laws, emergency action, safety for developmentally disabled and handicapped students, elementary industrial arts safety, hazardous materials, machine guarding, industrial materials, power technology, visual communications, instructional techniques pertaining to safety rules, equipment utilization and maintenance, materials handling, housekeeping, personal protection, facility planning, inspection checklists, and teacher liability in school shop accidents.

405. Guidelines for Safety in Industrial Arts and Technical Departments. Hamilton: Board of Education for the City of Hamilton, 1983. v.p.

406. Habingreither, Robert B. Noise evaluation as a learning activity in industrial arts education programs. Man/Society/Technology, v41 n5 p27-28, Feb. 1982.

The introduction of noise monitoring into the industrial arts curriculum not only brings contemporary industrial practices into the classroom but also gives an opportunity to study technology-related social issues.

407. Harshman, William C. Making shop safety relevant to occupational safety. Agricultural Education Magazine, v46 n9 p208,210, March 1974.

The McGuffey High School Vocational Agriculture Department, Claysville, Pennsylvania uses a shop safety demerit system, similar to those used in many industries, to relate safety to the real world of work. The system (context included) has proven effective in creating safety awareness.

408. Hartz, Edwin H. PCB's pose health hazard in the school shop. Snips, v11 n2 p6-7, Feb. 1982.

**409. Hay, Kenneth M., and others. Eye Protection in Kansas Schools. Topeka.: Kansas State Board for Vocational Education, Kansas State Dept. of Public Instruction, June 1967. 18p. Available ERIC. ED 025 118.

A law passed by a state legislature requires that students in industrial arts shops and science laboratories must wear eye protective devices. Explanatory material presents the text of the bill and guidelines for implementation, including -- (1) types of eye hazards, (2) types of protective devices, (3) administrating eye safety equipment, (4) financing and manufacturers, and (5) recommended eye protection for specific subject areas such as industrial arts, science, art, and technical-vocational education. A synopsis of the United

States of America Standards Institute safety code for goggles, spectacles, and lenses is also provided. Drawings of safety spectacle types and monogoggles are included.

410. Herndon, Ed. Is your shop fireproof? School Shop, v32 n2 p68-69, Oct. 1972.

411. Hidden danger in fiberglass catalyst. Insite, v6 n3, Spr. 1974.

**412. High school welding shop ventilation. Air Engineering, v6 p38-39, Sept. 1964. NIOSH-00008076.

Answer to a question regarding the possible use of a filter system of high efficiency filters with activated carbon in ventilating a high school welding shop. Local exhaust ventilation is suggested in preference to general or dilution ventilation. Flexible duct systems can effect good control if the welder works in the effective range of the hood. Booth enclosures, canopy hoods, and lateral slot hoods are generally used on table ventilation. For collecting welding fumes, fabric type collectors have been used successfully. There is no value in installing activated charcoal to remove fume, since it is not a fume filter. Electrostatic precipitators of the low voltage type also are not suited for arc welding. Fresh air should be supplied through a make-up heater designed and thermostated to heat the air from the low outside air design temperatures to the room air discharge temperatures.

413. Jacobs, C.O. A low-cost, effective, fumes exhaust system. Agricultural Education Magazine, v51 n11 p252-54, May 1979.

Discusses the importance of avoiding welding fumes. The sources of these fumes are presented in a table. Criticizes currently used ventilation systems and reviews the Occupational Safety and Health Act requirements. Describes a low-cost exhaust system developed for agricultural mechanics laboratories.

414. Jewell, Larry R. Effects of noise on student performance. Journal of Vocational Education Research, v5 n3 p47-53, Summer 1980.

This study provides experimental evidence that noise intensities typical of those found in vocational education laboratories are detrimental to student performance. As noise intensities increase in the learning environment, the time required to complete assigned tasks increases.

**415. Khorobrykh, V.P. Hygienic evaluation of the color of the furniture of a school metal-working shop. Hygiene and Sanitation, v29 p29-43, Nov. 1964. NIOSH-00003907.

Report on the hygienic evaluation of the different variants in painting the furniture of a school metal-working shop. The variants evaluated are: painting black the surfaces of the workbenches, vises and protective screens; painting the workbenches dark green and the vises and screens black, painting the workbenches light green and the screens and vises yellow. When illuminated with a 1320 watt lamp the illumination of the work areas was different according to the paint. In the first variant the illumination was 507 luxes; the second variant, 535 luxes; the third variant, 594 luxes. Other effects noted as a result of color changes are: more favorable indices for the latent periods of the visual-motor reaction time, stability of color vision, and visual contrast sensitivity when the workbenches are painted dark green or light green than when painted black.

416. Luff, Howard. Ceiling-mounted table saw guard. School Shop, v29 n2 p72-74, Oct. 1969.

417. Lutz, Ronald J. Testing for safety. School Shop, v32 n4 p26-27, Dec. 1972.

Discusses a procedure for measuring students' awareness of safe operating procedures for a given machine or tool.

418. Lutz, Ronald J., and Virginia L. Pearson. Teaching safety to the special needs learner. Industrial Education, v67 n2 p20,22-4,26, Feb. 1978.

Examines standard and unique student safety considerations and offers suggestions for maintaining a safe laboratory class environment. Topics discussed include general safety considerations, safety factors unique to various handicapping conditions, instructional considerations, assessing instruction, and developing safety conscious attitudes.

419. Maddalena, Albert R. Foundry safety floor. School Shop, v29 n4 p56, Dec. 1969.

The installation of a steel grate over a sunken sand moat reduces the safety hazard from spillage of molten metal.

420. Manual for eye and face protection for education institutions. Environmental Health & Safety News, v24 n7-12 p1-23, July-Dec. 1976.

**421. Mayers, M.R. Vocational Schools I. General Industrial Hygiene Problems. New York State Department of Labor, Division of Industrial Hygiene and Safety Standards, Monthly Review, v26 n6 p25-28, June 1, 1947. NIOSH-00042999.

A discussion is presented on the medical, chemical, and engineering problems of maintaining proper industrial hygiene in vocational schools. The similarities between the vocational school and the small industrial plant and the problems they both share are stressed. The small plant and vocational school are generally housed in a makeshift building which was built without regard for the uses to which it would be put, making safety control and engineering difficult. In addition, the small plant rarely has funds to call in experts to design exhaust ventilation for special processes, or to convert existing floor plans to these needs. The small plant usually cannot afford to employ an experienced safety engineer, is more apt to use second-hand machinery and equipment, and is less apt to keep it in good repair; it usually cannot afford an adequate medical center or staff, and generally has inadequate safety programs as compared to larger factories. All of these factors tend to aggravate the industrial hazards faced by small plants, and likewise, vocational schools with small plants. An example is presented of a case of acute methyl cellosolve poisoning which occurred in a vocational school work shop, due to inadequate safety ventilation equipment and lack of safety engineering experience on the part of the shop foremen. Additionally discussed are the hazards of several industrial chemicals, including carbon tetrachloride, benzol, carbon disulfide, trichlorethylene, naphthas, and carbon monoxide.

**422. McDole, Thomas L. Instructor Liability -- A Continuing Dilemma. Summary of a presentation at the Annual Meeting of the American Industrial Arts Association, Milwaukee, WI, April 22, 1983. 4p. Available ERIC. ED 233 236.

This brief guide discusses ways to provide safe instruction and to minimize the risk of injury and potential liability in a laboratory environment. The three main concerns covered are: (1) the physical plant must be in compliance with the Occupational Safety and Health Administration (OSHA); (2) the physical facility should have all tools in good working condition and have written records of maintenance and inspection activities; and (3) the instructional program should present curriculum and lessons that are current and relevant to present-day industrial practices and standards.

423. Miller, Harry J. The shocking problem in the shop. School Shop, v40 n2 p21-22, Oct. 1980.

Discusses electricity in school shops. Details causes of accidents due to electric shock and ways to prevent them. Stresses the importance of shop safety procedures regarding electricity.

**424. Mississippi Research and Curriculum Unit for Vocational and Technical Education. Eye Safety. Mississippi Industrial Arts. Jackson, MS.: State College, Mississippi Society to Prevent Blindness, Mississippi State Dept. of Education, Jackson. Div. of Vocational and Technical Education. Nov 1981. 24p. Available ERIC. ED 215 186.

This manual is designed to help industrial arts teachers eliminate student eye injuries within industrial arts programs. Presented first is Mississippi eye safety law. Following a discussion of eye protection equipment, illustrations of eye protection devices are provided. Guidelines are set forth for selecting shade numbers for welding filters. Outlined next are various eye protection areas and eye protection requirements in various areas of industrial arts. Following a description of first aid procedures for eye emergencies, information is provided on the Wise Owl Clubs of America and eye safety resource materials available from the Mississippi Society to Prevent Blindness.

**425. O'Neil, J. Industrial eye protection: a progress report. Occupational Hazards, v32 p39, Feb. 1970. NIOSH-00009623.

Discussion of industrial eye protection based on the eyewear standard developed by the American National Standards Institute (Z.87.1-1968). Topics include the use of substandard glasses, the use of cautionary labels on safety eyewear, workers preference for visitors' glasses instead of eye wear designed for long term protection, and the lack of eye protection in school laboratories and shops.

426. O'Neil, James E. Wise owl: symbol of sight. Agricultural Education Magazine, v45 n3 p70, Sept. 1972.

Discusses establishment and membership requirements for a Wise Owl Club, whose purpose is to reduce needless and costly eye accidents and loss of sight.

427. On-the-job safety rules for power tool operation. Ontario Industrial Arts Bulletin, v43 n4 p32-33, 1984.

428. Pasternak, Stephen. The law and choosing eye protection. Industrial Arts and Vocational Education, v59 n7 p36-37, Oct. 1970.

Guidelines to aid teachers in selecting the correct eye protective device for students who are engaged in various laboratory activities.

**429. Plakke, Bruce L, and Jerome D. Brown. For the Prevention of Hearing Loss: A Guide for Iowa Industrial Arts Teachers. Des Moines: Iowa State Department of Public Instruction, Division of Special Education, October 1984. 18p. Available ERIC. ED 251 691.

This guide is designed to assist industrial arts teachers in expanding their knowledge of hearing conservation and to enable them to answer some routine questions that their students may have concerning hearing protection and hearing loss. Addressed in the individual sections of the guide are the following topics: industrial arts, hearing protection, and the law; requirements for ear-protecting devices as set forth in the Iowa Code; legal limits for noise exposure; the structure and functioning of the ear; commonly asked questions about the ear; procedures for measuring hearing; noise and hearing loss; audio demonstrations of simulated hearing loss; symptoms of hearing loss; procedures for establishing a hearing conservation program; kinds of hearing loss; the effects of noise on hair cells; and sources of help in implementing a hearing program. A bibliography and list of suggested references conclude the guide.

430. Plakke, Bruce L. Hearing conservation in secondary industrial arts classes: a challenge for school audiologist. Language, Speech, and Hearing Services in the Schools, v16 n1 p75-79, Jan. 1985.

A survey of secondary industrial arts teachers showed little knowledge of hearing conservation methods. Although 47 percent of the teachers believed that they had acquired an occupational hearing loss, they did not use personal hearing protection.

431. Plakke, Bruce L. Hearing protection in the school laboratory. The Technology Teacher, v43 n7 p10-12, April 1984.

Describes various types of available hearing protection devices, the advantages and disadvantages of each type, and the fitting and maintenance necessary for personal hearing protection.

**432. Provide for Student Safety. Second Edition. Module E-5 of Category E -- Instructional Management. Professional Teacher Education Module Series. Columbus: Ohio State Univ., National Center for Research in Vocational Education. 1983. 51p. Available ERIC. ED 228 418.

One in a series of 127 performance-based teacher education learning packages focusing on specific professional competencies of vocational teachers, this learning module deals with providing for student safety. It consists of four learning experiences. Covered in the individual learning experiences are the following topics: providing for student safety needs (safety consciousness; general safety regulations; tool and equipment safety; general housekeeping; personal habits; personal protective equipment and apparel; recordkeeping; and national, state, and local agencies); preparing a safety handbook based on applicable local, state, and federal safety laws and student performance objectives; providing for student safety needs and analyzing the performance of other instructors in providing for student safety needs in simulated classroom situations; and providing for student safety in an actual teaching situation. Each learning experience contains an objective, required and optional learning activities, and feedback activities.

**433. Recommendations for Health and Safety in Workshops of Schools and Colleges. London, United Kingdom: Publications Department, British Standards Institutions, 1975. 27p. NIOSH-00070322.

This standard gives general guidance, and more detailed information where necessary, on the procedures to be followed to ensure the safety of users in workshops of schools and colleges. Contents: general design, layout and use of workshops, general precautions for machine tools and associated equipment, and additional safeguards for certain types of equipment; other processes and plant; portable power tools; hand tools; safeguards and special equipment for automobile engineering; hazards of manufacture and working of plastics, and safeguards.

434. Roeser, Ross J., and others. Implementing an industrial hearing conservation program in the schools. Journal of School Health, v53 n7 p408-11, Sept. 1983.

A hearing conservation program was adopted in industrial arts classes in the Dallas (Texas) Independent School District to (1) protect students and teachers using hazardously noisy equipment and (2) inform students of the dangers of excessive noise. A noise survey conducted earlier indicated a need for the program.

435. Rose, Homer C. Special safety devices for the table saw. School Shop, v31 n6 p42-43, Feb. 1972.

**436. Rubinsky, W., and N.F. Smith. An Investigation of the Frequency of Accidents with Small Power Tools. Washington, D.C.: Injury Control Research Laboratory, Health Services and Mental Health Administration, Public Health Service, U.S. Department of Health, Education and Welfare. 1972. 17p. NIOSH-00131150.

The incidence of accidental injuries sustained by operators of small power tools was investigated. Power tools of interest used both in industry and in the home were electric drills, bench grinders, portable electric saws, and drill presses. Data was collected from government, industries, schools, and hospitals. The state agencies of Ohio, New York, Illinois, and Rhode Island reported 5927 injuries due to power tool accidents. Four industrial companies reported a total of 39 power tool injuries. A grinder was involved in 22 of these cases, a drill in 7, and a saw in 2 others. Twenty high school shop teachers ranked the bench saw as the most hazardous power tool with respect to disabling injuries. The next most hazardous was the skill saw, and the least hazardous were the disc sander and power hand drill. Statistics from two hospitals showed that there was a greater proportion of small power tool injuries in a rural area than in an urban, industrial area. Approximately 40 percent of these accidents occurred during the summer months. About 73 percent of the injuries were associated with saws, drills, or grinders. Laceration type injuries accounted for 84.5 percent of the accidents. The authors conclude that improvements in education and training should be made in the use of small power tools. They suggest the use of simulators to study the mechanisms of accidents.

437. Ruffino, Charles R., and Charles E. Canterbury. The visually handicapped in the IA environment. *School Shop*, v37 n8 p70-1, April 1978.

This article discusses how the industrial arts teacher can help foster growth and independence by anticipating and being sensitive to the needs of visually handicapped students in the following areas: equipment operation, orientation, and mobility in the shop; material aids; and devices for adaptation.

438. Safety -- Alberta government memorandum. *Industrial Education Council Newsletter*, v12 n2 p11-13, Mar. 1980.

*439. Safety in industrial arts programs. *Education (N.S.)*, v9 n6 p6-7, Jan. 31, 1979.

It is of paramount importance that the industrial arts teacher establish a comprehensive safety program and develop a wholesome safety consciousness among industrial arts students. This article presents a list of considerations which should be included in all industrial arts safety programs. Special precautions against fire are emphasized.

440. Sampara, P. *Control of Exposure to Welding Fumes and Gases*. Hamilton: Canadian Centre for Occupational Health and Safety, 1985.

441. Sampara, P. *Les effets des émanations de soudage sur la santé*. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1985.

442. Sampara, P. *Health Effects of Welding Fumes and Gases*. Hamilton: Canadian Centre for Occupational Health and Safety, 1985.

443. Sampara, P. *Réduction de l'exposition aux émanations de soudage*. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1985.

**444. Shashack, Willard F., Ed. *Occupational Safety and Health Act Handbook for Vocational and Technical Education Teachers*. Urbana: Illinois Univ., Dept. of Vocational and Technical Education. July 1974. 75p. Available ERIC. ED 112 242.

The purpose of the handbook is to assist the school shop teacher in participating in voluntary compliance with the standards and regulations of the Occupational Safety and Health Act of 1970. The first major section deals with general shop safety and how the shop teacher can use the checklist to control possible safety violations in his shop. The following chapters are of a specific nature, with checklists to meet requirements for the common areas of vocational education: machine tool, welding, woodworking, electricity, automotive, and drafting. At the conclusion of the guide, there is a section dealing with general recordkeeping and accident reporting, a time table for implementation of safety standards, and a suggested instructional reference list.

445. Smith, Harry T. Safety: an attitude. Industrial Education, v67 n5 p43-4, May-June 1978.

Describes eight safety concepts developed by the author to teach safety and accident prevention in industrial arts shops and to promote more positive student attitudes toward shop safety. Stressing several general safety concepts instead of requiring dozens of rules has been found to work.

**446. South Carolina State Dept. of Education. South Carolina Industrial Arts Safety Guide. Administrator and Instructor Section. Columbia: South Carolina State Dept. of Education, 1981. 49p. Available ERIC. ED 205 807.

This administrator and instructor section of a South Carolina industrial arts safety guide includes sections on responsibility for school safety, safety programming for the teacher, emergency action, suggested forms and outlines, and facility design and layout. School board and superintendent, administrator, and teacher responsibilities for school safety are outlined. Discussed in a section on safety programming for the teacher are instructional techniques, safety inspections, accident reporting and analysis, safe practices in the care and operation of equipment, housekeeping practices, electrical safety, fire safety, first aid planning, personal practices, and eye protection. Emergency communications and first aid procedures are described in section 4. Presented next are suggested forms and outlines, including forms for recording emergency telephone numbers and parent permission and acknowledgement slips, master checklists, hazardous conditions reports, and first aid and emergency procedures. Space allocation, lighting, ventilation, personal facilities, selection of machine tools, special hazards, and noise control are examined in a section on facility design and layout. (The student section of the guide is available separately)

**447. South Carolina State Dept. of Education. South Carolina Industrial Arts Safety Guide. Student Section. Columbia: South Carolina State Dept. of Education, 1981. 85p. Available ERIC. ED 205 806.

This student section of a South Carolina industrial arts safety guide includes guidelines for developing a student safety program and three sections of shop safety practices. Safety program format, safety committees, safety inspection, and student accident investigation are discussed in the section on developing a student safety program. Set forth in the section on general safety practices are safety instructions for all areas of industrial arts; safety rules for machine tools, hand tools, and portable electric hand tools; housekeeping; back strains and proper lifting; safe lifting; materials handling; personal practices and conduct; and fire control. Section 4, on specific processes and operations, covers safety procedures relating to automotive and power mechanics; compressed gas; drafting rooms; dusts, fumes, and combustible materials; foundry practices; flammable and combustible liquids; electricity/electronics; graphic arts; soldering; and storage batteries. Examined in the section on safety procedures for machines are buffers, drill presses, forges, grinders, jointers, lathes, milling machines, presses, saws, sanders, metal shapers, shears, sheet metal machines, planer-surfacers, and welders. (A corresponding administrator and teacher guide is available separately)

*448. Stanley Associates Engineering Ltd. Industrial Education Ventilation Study. Edmonton: Alberta Education, Planning Services, 1983. 3 vol. (Vol. 1 - final report, vol. 2 - technical report, vol. 3 - technical appendices).

The general purpose of this study was to research aspects of ventilation in industrial education facilities in selected junior and senior high schools. The detailed results of the tests that were conducted on 20 selected industrial arts laboratories indicated high dust concentration, high noise level and insufficient make-up air in a large number of the test areas. Nineteen recommendations for improving working conditions in these areas are contained in the Final Report.

449. Stephen, Murray I. Letter to the editor. Ontario Industrial Arts Bulletin, v37 n1 p43-46, Spr. 1978.

Response to a previous article "Plastics Shop -- Safety and Health" by James G. Edwards.

450. Stones, I., and G. Spencer. Contact Lenses in the Workplace: the Pros and Cons. Hamilton: Canadian Centre for Occupational Health and Safety, 1985.

451. Stones, I., and G. Spencer. Les verres de contact au travail: avantages et inconvénients. Hamilton: Centre canadienne d'hygiène et de sécurité au travail, 1985.

**452. Stoudt, John Y., ed., and others. Pennsylvania Industrial Arts Safety Guide. Harrisburg: Industrial Arts Association of Pennsylvania. Aug 1978. 189p. Available ERIC. ED 166 376.

Safety education information is provided in this guide designed for Pennsylvania industrial arts teachers. Twelve sections and section topics include the following: introduction (policy statement on safety); responsibility (school board and superintendent, principal and/or department head, the teacher); emergency action (primary concerns, secondary concerns, communicating safety to parents, hazardous conditions report, accident reporting, accident reporting and analysis, accident report form); safety for developmentally disabled and handicapped students (suggested teaching techniques); elementary industrial arts safety; industrial materials (compressed gas, dust, fumes, flammable and combustible liquids, foundry safe practices, and woodworking); power technology, (general precautions, personal health considerations, grease, oil, fuels and solvents, storage batteries, and combustible liquids); visual communications (drafting room safety practices); instructional techniques, (safety inspections, safe practices in use and care of equipment, safety rules for power equipment, equipment instruction sheets and evaluation, and safety rules for portable electric hand tools); personal protection (eye protector selection chart, lesson plan for eye safety, chart of noise sources, respiratory protection, back strains and proper lifting); facility planning (generally accepted standards and practices); and teacher liability in school shop accidents.

453. Strong, M. E. Accident Prevention Manual for Training Programs. Chicago, Illinois: American Technical Society, 1975. 494p. NIOSH-00091315.

The passage of the Occupational Safety and Health Act in 1970 added impetus to the organized accident prevention program conducted in school shops. An accident prevention manual has been compiled to help students develop good safety attitudes, a safety consciousness, the ability to discriminate degrees of risk, and the ability to cope with real or probable hazards.

It assumes that the causes of accidents are a lack of knowledge, poor work habits and attitudes, unsafe behavior, and insufficient skill on the part of the worker, together with whatever hazards may be inherent in his work environment. Consequently, safety education and safety legislation are important both for the ways in which they may alter a work environment and the the ways in which they may encourage a worker to more accurately perceive his environment. The general problem of safety and accident prevention is covered including organizing safety programs; developing safety consciousness; creating a checklist for safety practices; planning and maintaining a safe environment; safety inspections; guarding mechanical hazards; OSHA and the vocational education teacher; personal protective equipment; health hazards; liabilities; recording and reporting of accidents; the use of national, state, and local agencies; and shop safety program evaluation. Appendices deal with threshold limit values for 1974 and with drawings of local ventilation situations.

**454. Turner, W.G. Attitudes of Undergraduate Industrial Education Students Toward Selected Safety Concepts. Tempe: Arizona State University, Department of Education, Doctor of Education dissertation, 1973. 174p. NIOSH-00090997.

To identify selected personal factors and experiences associated with more positive safety attitudes, a study was conducted to ascertain attitudes of undergraduate students enrolled in the Indiana State University Schooling of Technology toward safety concepts related to shop activities and facilities. The ten specific concepts rated by students were: instruction in proper handling of tools and equipment; instruction in safe handling of materials; teacher exhibiting good safety habits; housekeeping in the shop; teacher "talking up" safety; knowledge of hazards and remedies; eye safety; attitude toward safety; using personal protective equipment; procedures for lifting. The mean scores for all group variables indicated the favorable attitude of subjects toward the ten selected safety concepts. Students over 21 held attitudes more favorable than younger students toward four of the ten safety concepts. Married students' attitudes were more favorable than unmarried students toward eight of ten concepts. Students who experienced three or more semesters of industrial education in high school had more favorable attitudes toward four of the ten concepts when compared to students who had fewer semesters. Subjects who had taken a safety education course in college held more favorable attitudes toward four of ten concepts when compared to those who did not take such a course. Industrial work experience of six months was not a significant factor. Students' attitudes toward the concepts were not significantly more favorable as a result of experience with a serious injury. No one subject matter was outstanding in developing more favorable student attitudes toward the safety concepts. Freshmen students had less favorable attitudes toward seven of the concepts. Seniors' attitudes were more favorable toward five of ten concepts. Age and experience do make a difference on receptivity to safety concepts. Further study should consider the influence of similar personal factors and the influence of a separate safety course.

455. Umstattd, William D. Becoming sensitive to sound. Man/Society/Technology, v40 n4 p9-10, Jan. 1981.

Sensitivity to the sounds and noises affecting the operation of industrial arts and vocational education programs is imperative for the professional educator. All teachers need to develop the capacity to "tune-in" on noises or sounds which signify prompt reaction to a hazardous condition or an unsafe act.

**456. Wahl, Ray. A Safety and Health Guide for Vocational Educators. Incorporating Requirements of the Occupational Safety and Health Act of 1970, Relevant Pennsylvania Requirements with Particular Emphasis for Those Concerned with Cooperative Education and Work Study Programs. Volume 15, Number 1. Harrisburg: Pennsylvania State Department of Education, Bureau of Vocational and Technical Education, Feb. 1977. 165p. Available ERIC. ED 142 708.

Intended as a guide for vocational educators to incorporate the requirements of the Occupational Safety and Health Act (1970) and the requirements of various Pennsylvania safety and health regulations with their cooperative vocational programs, the first chapter of this document presents the legal implications of these safety and health regulations and focuses on their applicability to the school and the school's personnel. Chapter 2 details the provisions and standards of these regulations and clarifies the human factors involved. Included in the third chapter are all the definitions, the format, guidelines, procedures, and related information needed by the educator for incorporating safety and health into the educational program. The fourth chapter presents a self-inspection checklist, and the fifth chapter provides a list of hazards and standards along with the source of each. The final chapter provices a list of resource materials and identifies several agencies and organizations who provide assistance and additional information. Included in the appendix are a suggested statement of safety and health policy and excerpts from federal regulations related to child labor practices, orders, and statements of interpretation.

457. Walker, John R. How to anchor machinery in your school shop. Industrial Education, v67 n4 p30-32, April 1978.

An industrial arts teacher explains the need to mount school shop machinery securely and describes methods of mounting permanently or temporarily. Reasons for anchoring machine tools are safety, accuracy of operation, and the prevention of damage to the machine. Five figures illustrate anchoring and leveling.

458. Walker, John. Teacher responsibility. Industrial Education, v66 n4 p23, April 1977.

A discussion of the teacher's responsibility to students with regard to safety in the shop.

459. Wasiloff, Thomas. Shop safety and how to promote it. Technical Education News, v35 n2 p8-9, Jan/Feb. 1976.

**460. Williams, William A. An Accident Prevention Program for School Shops and Laboratories; A Suggested Guide for School Administrators. Chicago, Ill.: National Safety Council, 1966. 254p. Available ERIC. ED 035 733.

Effective and realistic planning and improvement of the educational environment can prevent accidents and injuries in school shops and laboratories. This guide makes specific recommendations for organizing and administering such a program and suggests methods and techniques for implementing the recommendations. Chapters cover organizing, administering, and implementing an accident prevention program, education and training for accident prevention, and a bibliography of books, pamphlets, booklets, periodical articles, unpublished materials, visual aids, posters and charts, and catalogs and directories. Appended are (1) state level -- master plan format for accident prevention in school shops and laboratories, (2) local level -- master plan format for accident prevention in school shops and laboratories, (3) an outline for a school shop safety program, (4) acknowledgement of safety instruction and pledge, (5) sources of helpful national organizations, (6) model school eye safety law, (7) job safety analysis -- work sheet, and (8) national standard school shop safety inspection list.

461. Williams, William A. Shop safety rules and regulations. School Shop, v31 n8 p50, April 1972.

462. Williams, William A. Teaching practices for accident prevention. School Shop, v31 n8 p48-49, April 1972.

463. Willis, Bob. Safety -- injection molding machine safety guard. Industrial Education News, v12 n2 p13-14, Mar. 1980.

464. Wolff, Charles S. After 5 years: OSHA and the school shop. School Shop, v35 n8 p66-7,69, April 1976.

Past and pending safety and health regulations set by the Occupational Safety and Health Administration are examined; special emphasis is placed on their implications for school shops.

465. Woodford, Charles, and Mary Lynn O'Farrell. High-frequency loss of hearing in secondary school students: an investigation of possible etiologic factors. Language, Speech, and Hearing Services in the Schools, v14 n1 p22-28, Jan. 1983.

Data were collected on sound levels in public school shops, the policies regarding hearing protection and sound level monitoring in shops in a four state area, and hearing levels of students with varying histories of noise exposure. Sound levels in most school shops are sufficient to constitute a hazard to hearing.

466. Woodruff, Alan P. Better planning for vo-tech labs. American School and University, v49 n12 p52,54-55, Aug. 1977.

The design of vocational laboratories must reflect four major design criteria: (1) work flow and activity relationships; (2) equipment size and orientation requirements; (3) mechanical system requirements; and (4) requirements related to supervision, safety, and control.

NATURAL HAZARDS

**467. Abernethy, James J. Tornado Protection: Selecting and Designing Safe Areas in Buildings. Southfield, Mich.: Lawrence Institute of Technology, April 1976. 67p. Available ERIC. ED 151 941. Microfiche only.

Tornadoes and extreme winds cause heavy loss of life and property damage throughout the United States. Most buildings offer significant protection from this danger, and building administrators should know the areas where this protection is available. This booklet presents a review of three schools, all of which were struck by tornadoes on April 3, 1974. Damage to these buildings from the tornadoes was examined by teams of specially trained architectural and engineering faculty, the various building administrators, and representatives of the architectural firm that designed the buildings. From these studies, guidance has been developed on selecting best-available shelter from high winds in existing buildings. Information in the brochure can also be useful to architects and engineers in designing new buildings that would offer protection from high winds.

**468. Culver, Charles G., and others. Natural Hazards. Evaluation of Existing Buildings. Building Science Series 61. Washington, D.C.: National Bureau of Standards (DOC), Jan. 1975. 962p. Available ERIC. ED 128 914.

A methodology is presented for survey and evaluation of existing buildings to determine the risk to life safety under natural hazard conditions and estimate the amount of expected damage. Damage to both structural and nonstructural building components resulting from the extreme natural environments encountered in earthquakes, hurricanes, and tornadoes is considered. The methodology has the capability of treating a large class of structural types. Three independent but related sets of procedures for estimating damage for each of the natural hazards are included in the methodology. The first set of procedures provides a means for qualitatively determining the damage level on the basis of data collected in field surveys of the building. The second set utilizes a structural analysis of the building to determine the damage level as a function of the behavior of critical elements. The third set is based on a computer analysis of the entire structure. The procedures are presented in a format which allows updating and refining. Numerical examples illustrating application of the procedures are included.

**469. Dexter, Arthur. Environmental Hazards and Systems Schools. Technical Report No. 81. Washington, D.C.: Defense Civil Preparedness Agency (DOD), Office of Education (DHEW); Knoxville: Tennessee Univ., School Planning Lab. Nov. 1973. 27p. Available ERIC. ED 098 730.

The purpose of this study was to ascertain the feasibility of incorporating certain protective concepts into selected systems-constructed schools. These concepts were to be incorporated at a minimal cost increase, with minimal sacrifice of amenities, and with no detrimental effect on facility configuration. The environmental hazards taken into consideration were earthquakes, tornadoes, hurricanes, and noise. The five schools selected for analysis are currently in use. The design changes are offered as suggestions that might be incorporated into future designs in order to better protect the inhabitants of the facility.

470. Don't ignore lightning. American School and University, v48 n3 p32-33, Nov. 1975.

Risks of lightning losses and casualties can be minimized by a lightning protection system.

471. Earthquake laws force schools underground. American School and University, v45 n11 p23-25, July 1973.

Two underground schools in Santa Ana are an interesting solution to California's need for new schools that will resist earthquakes.

**472. Lawrence Institute of Technology. What's Left After a Tornado. Southfield, Mich.: Lawrence Institute of Technology, July 1975. 34p. Available ERIC. ED 119 395.

Following recent tornadoes, teams of specially trained architectural and engineering faculty conducted onsite examinations and research of building damage. It was concluded that tornado damage to buildings is predictable. A trained architect or engineer can establish, before a tornado strikes, those portions of the building that will offer the greatest protection to the occupants. The characteristics of tornadoes are explained in text and illustrations. Case studies are given of three school buildings hit with different, intense tornadoes. The hazardous and protective elements of the buildings are identified, and the tornado shelter quality of portions of these buildings rated as primary or secondary shelter. The purpose of this brochure is to assist architects and engineers to design facilities that offer tornado protection, and administrators to identify the best available shelter space.

473. Napier, Erv, and Janet Pritchard. Planning for tornados. American School and University, v53 n6 p64-65, Feb. 1981.

Tornadoes are a very real threat to many schools. Planners should be aware of a number of design and construction considerations that will help to insure safe spaces for school children and other occupants.

474. School safety down to earth: California's earthquake-resistant schools. Progressive Architecture, v60 n2 p73-79, Feb. 1979.

Schools in California being built to resist damage by earthquakes are part of a program to meet building standards established in 1973. The three new schools presented reflect the strengths and weaknesses of the program.

**475. Ward, Delbert B. Schools in Kansas with Tornado Protection. Shawnee Mission Public Schools -- District No. 512. Battle Creek, Mich.: Defense Civil Preparedness Agency (DOD), July 1973. 39p. Available ERIC. ED 083 670.

Kansas and nearby Missouri are among the half-dozen states in America having the greatest frequency of tornadoes of any region in the world. This booklet describes a districtwide approach of designing and constructing tornado-resistant shelters as integrated parts of the school facilities. The design criteria for tornado protection also resulted in fallout radiation protection. The technical data for, drawings, and photographs of 18 schools are included.

476. Weigel, Edwin P. Some new ideas about tornadoes. Science and Children, v13 n2 p10-14, Oct. 1975.

Based on the assumption that if occupants of buildings knew which places in these buildings were relatively safe in disasters such as tornadoes, and if they had sufficient warning, architects and engineers feel there is a significant opportunity to advance the art of school (or building) design to provide tornado-protected areas.

**477. Wisconsin State Dept. of Public Instruction. Tornado Emergency Readiness Planning for Schools. Madison: Wisconsin State Dept. of Public Instruction, 1967. 18p. Available ERIC. ED 025 107.

A place of safe refuge in the event of violent natural forces or a tornado should be included in the design of all new school buildings. Existing school buildings should be analyzed by the architect, contractor, or engineer to determine if a safe place exists or if one can be readily adapted. Most criteria for fallout shelters are the same for natural disaster shelters and free technical assistance is available through local and state civil defense agencies. Tornado alarm systems should be different or a variation of the regular fire alarm and a secondary system should be available in case the power supply is disrupted.

PHYSICAL EDUCATION, RECREATIONAL FACILITIES AND OUTDOOR EDUCATION

478. Acoustic panel treatment enhances school/community swimming pool. School Business Affairs, v45 n10 p34, Oct. 1979.

Background noise and reverberation were reduced at the Weston, Massachusetts, indoor swimming pool by installing aluminum insulated panels.

**479. American Alliance for Health, Physical Education, and Recreation. Selected Problems in Sports Safety. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, 1975. 93p. Available ERIC. ED 117 052. Microfiche only.

This publication, covering a broad spectrum of sports safety problems, is designed as a source of information for those who plan, organize, administer, or evaluate various physical education and recreational activities, athletics, or sports. In the first section, the prevention of sports injury is stressed with attention to different age groups and sexes. Some of the topics discussed are unsafe acts, qualified supervisors, effectiveness of injury control factors, safe equipment, maintenance of surfaces and facilities, enforcement of rules, and the acceptance of degrees of risk. The second section deals with preconditioning, equipment, training, supervision, and specific safety criteria in skiing, trampolining, skin and scuba diving, and boating. The topic of the third section is athletic training and emergency care. This section includes discussions of athletic facility safety, medical practices in sports, and emergency care practices for spectators at athletic and sports events. The fourth section discusses the legal liability of physical educators with regard to curriculum and negligence, the school's and coach's legal responsibilities in athletics, the legal rights and responsibilities of team physicians, the legal aspects of adult physical fitness programs, and exemptions from civil liability for physical educators while giving emergency care.

**480. American Association for Health, Physical Education, and Recreation. Annual Safety Education Review 1970. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1970. 78p. Available ERIC. ED 075 406. Microfiche only.

This booklet presents articles completed in 1970 by the Division of Safety Education of the American Association for Health, Physical Education, and Recreation. The 11 articles deal with the following topics: a) the problem of apathy in safety education, b) the safety aspects of archery and riflery, c) weight training for high school girls, d) safety supervision of sports for girls, e) the problems of injury and accident prevention, and f) the Sports Safety textbook project.

**481. American Association for Health, Physical Education, and Recreation. Annual Safety Education Review 1971. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1971. 75p. Available ERIC. ED 075 407. Microfiche only.

This booklet presents articles completed in 1971 by the Division of Safety Education of the American Association for Health, Physical Education, and Recreation. The 11 articles deal with the following topics: a) athletic training programs, b) safety considerations in winter sports, c) safety considerations in gymnastics, d) emergency care, e) athletic training professional preparation, f) safety precautions in planning facilities, g) athletic training in girls' sports, h) problems in water safety, and i) safety for the seventies.

**482. American Association for Health, Physical Education, and Recreation. School Safety Policies With Emphasis on Physical Education, Athletics and Recreation. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1968. 33p. Available ERIC. ED 044 276. Microfiche only.

This booklet outlines principles of hazard control, school accident problems, and the need for guidelines and policies. Suggested general school safety policies, guidelines for courses in safety education and for the provision of facilities and supplies, policies for the administration of first aid and emergency care, and procedures for reporting and investigating hazards and accidents are provided. Emphasis is given to policies affecting the physical education, athletics, and recreation programs in the school.

*483. Anderson, Judith. High risk activities in P.E. Canadian School Executive, v2 n3 p26-27, Sept. 1982.

Negligence suits following accidents during gymnastics training attest to the high standards of supervision and equipment necessary to safely conduct this activity.

484. Arnold, Cheryl A. Injuries and Illnesses in Outdoor Education: A Study of an Ohio Upper-Elementary Resident Outdoor Education Program. Honors Project presented in partial fulfillment of the

requirements for the Degree Bachelor of Science, Ohio State University, 1981. 76p. ED 201 499. Not available ERIC.

Reported is a study of illnesses and injuries occurring during resident outdoor education programs at Camp Joy, Cincinnati, Ohio. The study involved an analysis of the nurse's and supervisor's records compiled during 12 one-week resident sessions with fourth, fifth and sixth graders from Cincinnati public schools (N=1271). The 71 injuries and 58 illnesses that occurred are described by season, location, event, nature of activity, and nature of illness or injury. Frequency and percentage calculations performed upon these data form the basis for conclusions regarding the incidence of injuries and illnesses by sex, season, nature of activity, and type of illness or injury. Also presented are recommendations for reducing the frequency of illnesses and injuries in resident outdoor education programs.

*485. Balderson, James. Backstop collapse turns cheers into screams. Canadian School Executive, v1 n1 p13, 1981.

Too many children sitting on a backstop during a school baseball game caused it to collapse. Numerous injuries were sustained.

**486. Bishop, Patrick J. Impact Characteristics of Ice Hockey Helmets. 1977. 16p. Available ERIC. ED 141 331.

This paper describes tests conducted on six different kinds of ice hockey helmets and discusses the safety factors in each.

**487. Borozne, Joseph, ed., and others. Administration and Supervision for Safety in Sports. Sports Safety Series: Monograph No. 1. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, American School and Community Safety Association. 1977. 69p. Available ERIC. ED 142 518. Microfiche only.

Examined in this monograph are issues concerned with accident problems in sports. Materials are organized under eight headings, each developed by an expert in the area: (1) the injury problem in sports; (2) philosophy of sports accident prevention and injury control; (3) an introduction to administration and supervision; (4) administration and supervision -- institutional controls; (5) the health examination; (6) leadership controls; (7) facilities, equipment and supplies; and (8) the significance of first aid and emergency procedures.

**487. Borozne, Joseph, ed., and others. Safety in Aquatic Activities. Sports Safety Series. Monograph No. 5. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, American School and Community Safety Association, 1977. 80p. Available ERIC. ED 153 993. Microfiche only.

The prevention of injuries and control of hazards in aquatic activities is outlined. Discussions include the causes and prevention of aquatic accidents, aquatic safety in the basic instructional program, the design of public swimming facilities, and safety considerations in pool operation and administration. A chapter is devoted to each of the following aquatic activities: springboard diving, tower diving, water polo, small craft use, water skiing, skin and scuba diving, and surfboarding.

**488. Borozne, Joseph, ed., and others. Safety in Individual and Dual Sports. Sports Safety Series. Monograph No. 4. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, American School and Community Safety Association. 1977. 54p. Available ERIC. ED 153 992. Microfiche only.

The prevention of injuries and control of hazards in individual and dual sports is outlined. A separate chapter is devoted to each of twelve sports: archery, bowling, equitation, golf, gymnastics, marksmanship, track and field, weight training and weight lifting, fencing, racquet sports, judo, and wrestling.

**489. Borozne, Joseph, ed., and others. Safety in Outdoor Recreational Activities. Sports Safety Series, Monograph No. 6. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, American School and Community Safety Association. 1977. 77p. Available ERIC. ED 160 587. Microfiche only.

Safety procedures are outlined for the following sports: fishing, hunting and shooting, skeet and trap, hiking and mountaineering, ice fishing, ice skating, skiing, snowmobiling, recreational motorcycling, and developmental and play activities.

**490. Borozne, Joseph, ed., and others. Safety in Team Sports. Sports Safety Series, Monograph No. 3. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, American School and Community Safety Association. 1977. 64p. Available ERIC. ED 147 268. Microfiche only.

This monograph examines methods of promoting safe practices in the conduct of selected team sports with the aim of reducing and eliminating the occurrance of injuries. The team sports discussed are baseball and softball, basketball, field hockey, tackle football, touch and flag football, ice hockey, lacrosse, and soccer.

491. Boyce, W. Thomas, and others. Playground equipment injuries in a large, urban school district. *American Journal of Public Health*, v74 n9 p984-86 Sept. 1984.

Epidemiologic features of playground equipment-related injuries were studied in Tucson, Arizona, over a two-year period. One-fourth of the injuries were severe, and climbing equipment was involved in a disproportionate number of accidents. Schools with smaller enrollments and alternative schools had more injuries than larger or traditional schools.

492. Bryce, G. Rex, and Ruel M. Barker. Variability and sampling inspection in the NOCSAE standards for football helmets. *Research Quarterly for Exercise and Sport*, v55 n2 p103-08 June 1984.

The variability in the testing procedures of football helmets is examined in this article. Inadequacies in standards for recertifying helmets indicates the probability of unsafe helmets being used.

**493. Buchanan, Edsel. *Playground Safety for the Handicapped*. Omaha: Nebraska University, 1979. 11p. Available ERIC. ED 196 226.

The paper presents information pertaining to both equipment and human factors associated with playground safety for the handicapped. Research is reviewed on injuries related to public playground equipment, the equipment/user interface, and accommodation of equipment for all children. Noted among findings are that 72% of all reported injuries were associated with falls, that the ability of children to use playground equipment safely depends on their capacity to make accurate perceptual discriminations, and that handicapped children select play activities similar to those of nonhandicapped children when provided accessible and safe play equipment. Causal factors for injury and potential remedial strategies are listed for climbing apparatus, slides, and swings. It is concluded that many accidents can be prevented by safety standards governing mechanical hazards, and through design criteria, modification of user behavior, and adaptations for appropriate sensorimotor, perceptual motor, psychomotor, and cognitive abilities.

494. Burke, William J. Planning safer playgrounds. American School and University, v52 n7 p42, March 1980.

How to avoid potentially dangerous playground conditions.

495. Cabelli, V.J. Swimming associated disease outbreaks. Journal of the Water Pollution Control Federation, v50 n6 p1374-77, June 1978.

Presents a literature review of recreational waterborne outbreaks and cases of disease, covering publications of 1976-77. This review includes retrospective and prospective epidemiological studies, and predictive models of the risk of recreational waterborn disease. A list of 35 references is also presented.

**496. Callahan, William T., and others. A Statewide Study Designed to Determine Methods of Reducing Injury in Interscholastic Football Competition by Equipment Modification. Final Report. Albany: New York State Public High School Athletic Association, Nov. 1969. 52p. Available ERIC. ED 037 745.

Through an examination of data on injuries to the lower extremities of varsity high school players, this study sought to ascertain 1) whether modified cleats brought about a reduction in the number and/or severity of such injuries; and 2) whether there existed an optimum combination of equipment for reduction in the number and/or severity of such injuries. After two years of gathering data and identifying other variables, it was determined that the lowest rate of serious knee injuries was incurred by youngsters outfitted with either low shoes, disc heels and ankle wraps or low shoes, shortie cleats and no ankle support. Data showed that those players with previous serious knee injuries were reinjured at a rate of 15 to 17 times greater than youngsters with no previous injury. Recommendations included: 1) all players be outfitted with low shoes and modified heels, discs, or shortened cleats; 2) consideration be given to modifying sole cleats; and 3) extensive efforts be undertaken to improve the physical conditioning of all football players.

497. Clarke, Kenneth S. Accident prevention research in sports: an exploration of reform. Journal of Health, Physical Education and Recreation, v40 n2 p45-48,65-70, Feb. 1969.

*498. Clarke, Kenneth S. Expectations for health supervision of school sports programs. NASSP Bulletin, v65 n446 p1-3, Sept. 1981.

Outlines the minimum requirements for a safe school athletic program, including a master plan for observation and treatment of injuries and the selection of a competent team physician and an athletic trainer.

**499. Consumer Product Safety Commission. A Child-Centered Playground Safety Curriculum Approach. Play Happy, Play Safely. Washington, D.C.: Consumer Product Safety Commission, 1970. 15p. Available ERIC. ED 175 539.

This learning approach emphasizes children's unique role in producing a safer playground environment. The emphasis is on awareness of safe play practices and an understanding of the safety hazards posed by poorly designed, poorly constructed, improperly maintained or misused equipment. The playground activities described are designed to help children bring their play to a safe conclusion by fostering individual attitudes of control and good judgment.

**500. Consumer Product Safety Commission. A Handbook for Public Playground Safety. Volume I: General Guidelines for New and Existing Playgrounds. Washington, D.C.: Consumer Product Safety Commission, 1981. 21p. Available ERIC. ED 205 496.

This handbook presents some general guidelines that may be used to increase the safety of public playgrounds. Information is provided about hazards associated with the use of public playground equipment, and suggestions are made to reduce the frequency and severity of injuries. A discussion is presented on playground-related injuries and the common accident patterns associated with children's play. Measures are suggested for designing playgrounds which take into account children's use of equipment. A section is included which offers ways to make existing playgrounds safer. The handbook concludes with a series of checklists which may be helpful in maintaining playground safety.

**501. Consumer Product Safety Commission. A Handbook for Public Playground Safety. Volume II: Technical Guidelines for Equipment and Surfacing. Washington, D.C.: Consumer Product Safety Commission, 1981. 31p. Available ERIC. ED 205 497.

This handbook suggests safety guidelines for public playground equipment and describes various surfaces used under the equipment and possible injuries resulting from falls. The handbook is intended for use mainly by manufacturers, installers, school and park officials, and others interested in technical criteria for public playground equipment. Information and suggestions on what to look for and what to avoid are covered: (1) assembly, installation, and maintenance of equipment; (2) materials from which equipment is constructed; (3) strength of individual components and structures; (4) sharp points, corners, edges, and other safety hazards; (5) base configuration of rotating equipment; (6) moving impact of swings; (7) entrapment; (8) falls from equipment; and (9) safety guidelines for surfaces under playground equipment.

**502. Consumer Product Safety Commission. Playground Equipment Guide: For Teachers, Park and Recreation Directors, Parents, Youth Leaders, and Other Concerned Adults. Washington, D.C.: Consumer Product Safety Commission, 1977. 19p. Available ERIC. ED 147 039.

This guide was designed to assist parents, teachers, youth leaders, and park and recreation directors in the safe selection, use, installation, maintenance and repair of playground equipment. The nature and necessity of children's play are discussed briefly and information is presented on four main types of playground equipment: (1) swings, (2) slides, (3) climbing apparatus and (4) seesaws. Nine especially dangerous features of playground equipment are identified and pictured.

503. Cotten, Doyice. A safer place to play. Teacher, v91 n1 p56, Sept. 1973.

Article lists several common playground hazards and suggests a student made film on the subject of playground safety.

504. Cowan, William M. How to cut the number and cost of accidents. American School and University, v54 n6 p60,62,66, Feb. 1982.

Presents ten steps, with emphasis on sports facilities, that administrators can take to make schools and campuses safer.

**505. Craig, Timothy T., Ed. Current Sports: Medicine Issues. Annual Safety Education Review -- 1973. Proceedings of the National Sports Safety Congress, Cincinnati, Ohio, February 15-17, 1973. Washington, D.C.: American Association for Health, Physical Education, and Recreation, Div. of Safety Education, 1974. 89p. Available ERIC. ED 092 547. Microfiche only.

This document is a collection of papers whose theme is sports safety. Section one, "Government Interest in Sports Safety," includes an article on Washington, D.C.'s focus on sports safety. Section two, "Medical Aspects of Safety in Sports," includes articles regarding the medical basis of restriction from athletics, orthopaedic restrictions, and neurological concerns in contact sports. Section three, "Product Safety," includes articles on the progress of the National Operating Committee on Standards for Athletic Equipment, obstacles in setting product testing standards, and the purchaser's dilemma. Section four, "Educational Standards in Sports Medicine," includes articles relating to the education of sports physicians and to certified curriculum in athletic training. Section five, "Athletic Injury Report," includes an article on reporting sports injuries. Section six, "The Female Athlete," includes articles on the nature and incidence of traumatic injury to women in sports and on safeguards and injury controls for the female athlete. Section seven, "Legal Considerations in Athletic Programs," includes articles on school and coach responsibilities in athletics and on the rights and responsibilities of team physicians. Section eight, "Supervision of Sports Programs," includes articles on safety in interscholastic athletic programs and on community involvement in athletic safety.

**506. Dawson, Rob. The Recognition and Management of Burnout. Paper presented at the Annual Conference for Experimental Educators, Portsmouth, NH, October 1979. 14p. Available ERIC. ED 207 744.

Staff burnout is a major hazard in outdoor wilderness education programs. Most susceptible are younger, first-time, idealistic, highly educated, overcommitted individuals who find difficulty in separating work from their private lives. The high risk, confrontational nature of adventure education, demanding work schedules, limited advancement opportunities, high staff turnover, friction between staff and supervisors, tenuous program funding, and substandard wages are among the causes of burnout. Recommended preventative approaches include reduction in successive days worked, rotation of positions and teams, weekly meetings, regular physical exercise, seminars on burnout, recognition for commendable work, establishment of mutual peer support systems, and involvement in organizational goal setting. Individuals should be aware of their personal motivation, contribute to open communication, and recognize that front-line involvement might be only two to three years maximum to be regarded as a developmental position in their careers.

507. Della-Giustina, Daniel. Skateboard safety. Journal of Physical Education and Recreation, v50 n6 p47-48, June 1979.

The growing number of skateboard injuries clearly indicates a need for both recreational facilities designed exclusively for skateboarders, and for accident-prevention oriented safety education programs.

**508. Dougherty, Neil J., IV. Teaching Physical Education: The Issues of Safety and Liability. 1979. 7p. Available ERIC. ED 178 495.

Guidelines are offered for supervision of school athletic activities with emphasis upon safety and legal responsibility. Of particular importance is selection of activities suitable for participants, safe facilities and equipment, knowledge of first aid, and the use of good teacher/coach judgment.

509. Dreistadt, Steve. Poisoned Playground. Berkeley, Calif.: City of Berkely, n.d.

Arsenic and pentachlorophenol-treated playground equipment may pose a serious health hazard to children who can receive doses of these wood preservatives in excess of the adult occupational safety standards. The City of Berkeley California has found that sealers can reduce arsenic levels in wood playground equipment 100-fold.

510. Egan, Sean. Boxing: the dangers and suggested rule changes. CAHPER Journal, v47 n6 p24-27+, July-Aug. 1981.

**511. Ewert, Alan. Teaching in a Cold Environment. 1979. 27p. Available ERIC. ED 171 441.

Instructors who teach outdoors in an environment so cold as to cause injury must satisfy program objectives while avoiding cold injury to themselves and students, help students focus on learning instead of discomfort, and alleviate some students' intense fear of the cold. Dealing with the cold successfully requires a thorough knowledge of: physiological reactions to the cold (shivering, vasodilation); fundamental laws of heat transfer; the causes and current treatments of the most common cold injuries (snowblindness, earache, dehydration, chillblains, hypothermia, and frostbite); and some specific techniques for staying warm (proper clothing properly worn, sleeping warmly, group shelters, "huddling"). Prior to the actual field experience instructors should alleviate fear of the cold by talking about it; teach students about cold injury, the appearance of a healthy body, and techniques for staying warm; establish communication with the students; and conduct a preparatory overnight trip. During the field experience itself instructors should teach by example; guard against dehydration; assume nothing about a student's knowledge or ability until it is observed; transfer much of the responsibility for keeping warm and healthy to the students; and maximize successes. Evaluation of the experience will improve future cold-environment outdoor teaching.

512. Frost, Joe L., and Michael L. Henniger. Making playgrounds safe for children and children safe for playgrounds. Young Children, v34 n5 p23-30, July 1979.

513. Gabrielsen, M. Alexander, and Ralph L. Johnson. A professional challenge -- swimming pool safety. Journal of Physical Education and Recreation, v50 n6 p43-46, June 1979.

Close attention to detail by aquatic personnel could conceivably reduce the annual number of swimming pool accidents and fatalities by as much as 50 percent.

*514. Gerrish, R. Probe into auditoria and gymnasia. School Administrator, v4 pp. 21-8, August 1967.

A survey of existing auditoria and gymnasia facilities in Canadian schools is presented. Factors that should be thoroughly considered before approving any design for a gymnasium, auditorium or multipurpose room are discussed. Recommendations for size, accommodation of spectators, acoustics, lighting and community access are presented.

515. Good playground equipment lets kids be kids -- safely. Executive Educator, v6 n2 p43, Feb. 1984.

Safety, durability, and maintenance costs should be considered when purchasing playground equipment. Other factors that affect equipment choice are the ages of the children using the playground, whether the playground will double as a public park, and whether the equipment is expandable.

516. Graham, Gerald P., and Patricia J. Bruce. Survey of intercollegiate athletic injuries to women. Research Quarterly, v48 n1 p217-20, March 1977.

The results of this survey show that the most common injuries to women, as to men, are sprains to the ankle and knee and that the sport of basketball has one of the highest injury rates.

517. Grieve, Andrew. Physical education, athletics, and the law: safety of facilities. Journal of Health, Physical Education, Recreation, v45 n8 p24-5, Oct. 1974.

**518. Halperin, W., and others. Conjunctivitis and skin erythema outbreak caused by a damaged high-intensity lamp. Journal of the American Medical Association, v240 n18 p1980-1981, October 27, 1978. NIOSH-00133798.

The cause of a sudden outbreak of mild rashes and conjunctivitis among members of two girl's basketball teams from a New Jersey high school was investigated. Investigators found that there were no rashes on body areas covered by clothing and discovered that there were cases in girls from four other high schools. The source of the outbreak was traced to a gymnasium in one of the schools where all persons with symptoms had played in or attended basketball games. Inspection of the high intensity mercury vapor lamps revealed a hole in the outer envelope of one lamp which caused it to emit harmful levels of ultraviolet light onto the bleachers below. Since damage to the lamp's outer envelope did not shatter the inner bulb or burn out the gymnasium lamp, there was danger that an undetected break could cause the area below another defective lamp to be irradiated for periods up to 2 weeks, the expected lifetime of the bulb. The authors state that this hazard can be minimized by regular bulb inspection and by being alert to the significance of glass on the floor, especially if a lamp is struck by a ball in the course of a game. The ultimate solution is a fail safe bulb which will cease to emit if damaged.

519. Hardy, Rex. Checklist for better crowd control. Journal of Physical Education and Recreation, v52 n5 p70-71, May 1981.

Tragic incidents such as sports riots or brawls occur at sporting events. Therefore, some attention should be given for the various methods open for crowd control. A checklist for better crowd control techniques is included.

520. Hennessy, Jeff T. Safety awareness and trampoline skills. Journal of Physical Education and Recreation, v51 n9 p36-38, Nov-Dec. 1980.

Standards for the proper and safe use of the trampoline in physical education classes are discussed. Guidelines for spotting, development of programs of instruction, and a sample trampoline lesson plan are outlined.

521. Hichwa, John S. The cargo net. Journal of Health, Physical Education and Recreation, v41 n1 p30-2, Jan. 1970.

522. Jordan, David. Karate: keep it safe. Journal of Physical Education and Recreation, v52 n1 p71-72, Jan. 1981.

Safety guidelines for each phase of a karate practice session are presented to provide an accident-free and safe environment for teaching karate in a physical education or traditional karate training program.

**523. Kaplan, Robert, Ed. Answers to Health Questions in Physical Education. American Association for Health, Physical Education, and Recreation, Washington, D.C.: American Medical Association, Chicago, Ill, 1970. 45p. Available ERIC. ED 075 434.

Culled from the answers of physical education teachers and coaches, this booklet attempts to indicate the scope of health problems and suggests some directions which the solutions may take. It is divided into three parts. Part 1, Health and Safety in Activity Programs, answers questions on first aid, excused absences, and desirability of competition for girls, and contact lenses in physical education classes. Part 2, Nutrition and Stimulants, discusses diet, water and exercise, smoking, and pep pills, while Part 3 is on infections and disease. A selected bibliography is provided.

**524. Kindig, Louise E. Sport Injuries for Females: Incidence and Prevention. Paper presented at the Convention of the Georgia Association of Health, Physical Education, and Recreation (Jekyll Island, GA, April 3, 1982). April 1982. 34p. Available ERIC. ED 217 034.

Comparisons between sport-related injuries for male and female athletes are discussed in relation to statistics gathered by the National Athletic Injury/Illness Reporting System (NAIRS) and other sources. Tables display data on: (1) athletic injuries and fatalities in colleges and universities by sport, 1975-76; (2) average annual frequency of significant injuries for selected collegiate sports, 1975-78; (3) rate and percentage of significant injuries in women's collegiate gymnastics associated with apparatus, 1975-78; (4) number of injuries by sport for females; (5) leading cause of injury by sport for females; (6) injuries in boys' and girls' sports (Oklahoma High School); (7) women's and men's reportable and significant injuries for game- and practice-related activities; (8) average annual rate and proportion of significant injuries in selected collegiate sports, by selected body part and indices of severity, 1975-78; (9) men's and women's reportable and significant injuries according to body part; (10) incidence, mean age, and average weekly training mileage according to anatomical location of injury for runners; (11) women's and men's reportable game- and practice-related injuries according to type; (12) average annual rate and proportion of significant injuries in selected collegiate sports by type of injury, 1975-78; and (13) incidence of ten most common injuries for runners by sex. In a discussion of these statistics, the importance of physical conditioning for the female athlete is emphasized, as well as the responsibilities of the athletic coach in preventing injuries and treating them competently.

*525. Laire, Dean E. Practical guidelines for health care management in secondary school athletics. NASSP Bulletin, v65 n446 p4-11, Sept. 1981.

Offers advice to schools that need to provide adequate health care for student athletes without benefit of a certified athletic trainer. Covers written policy concerning athletic trauma, maintenance of playing fields, medical records and consent forms, and equipment needed for injury prevention and care. Includes samples of forms and procedures.

526. Loft, Bernard I. Safety problems in physical education and athletics. Journal of Physical Education and Recreation, v52 n1 p60-61,76, Jan. 1981.

The issues of accident and injury prevention, and safety in physical education programs are discussed in terms of hazard identification and reduction, compensation for unavoidable risks, and avoidance of unnecessary hazards.

**527. Mahajan, Bal M., and William B. Beine. Public Playground Equipment: Impact Attenuation Performance of Surfaces Installed Under Playground Equipment. Draft. Washington, D.C.: National Bureau of Standards (DOC), Sept. 1978. 81p. Available ERIC. ED 182 056.

The objectives of this research effort were 1) to develop a methodology for assessing the impact attenuation performance of surfaces in relation to head injury, and 2) to test surfaces commonly installed under playground equipment to determine which surfacing materials, if any, are capable of providing protection against head injury that might result when a child falls from equipment and impacts the surface. It was decided to test eleven commonly used surfacing materials, with some materials comprising two or three surfaces depending upon the depth of materials. The impact attenuation performance of surfaces, in relation to head injury due to falls from playground equipment, was tested by dropping an instrumented American National Standard Institute (ANSI) headform on the surface and measuring the acceleration response of the headform. As the impact attenuation performance criterion, it is proposed that a surface should not impart a peak acceleration in excess of 200 g's (acceleration due to gravity) to the instrumented ANSI headform. Surfaces composed of six inches of loose materials such as pine bark, sand, shredded tires and shredded wood bark imparted peak accelerations which were below this limit for drop heights up to 10 feet. Surfaces composed of one layer of unitary material exceeded the criterion at drop heights of 5 feet or less.

**528. Mahajan, Bal M., and others. Public Playground Equipment: Suggested Safety Guidelines and Supporting Rationale for Public Playground Equipment. Washington, D.C.: National Bureau of Standards (DOC), Aug. 1978. 73p. Available ERIC. ED 183 252.

The purpose of these federal safety guidelines is to reduce the severity and frequency of injury associated with public playground equipment under conditions of normal use and reasonably foreseeable misuse. Safety guidelines are suggested regarding: (1) assembly, installation, maintenance instructions and identification; (2) materials of manufacture and construction; (3) sharp points and edges, protrusions, and pinch and crush points; (4) equipment that rotates about a vertical axis; (5) entrapment; and (6) falls from equipment. The guidelines apply to playground equipment intended for use in play areas of parks, schools, institutions, multiple family dwellings, private resorts and recreation developments, and other areas of public institutional use. They do not apply to amusement park equipment, equipment normally intended for sports use, or to home playground equipment. In addition, components of equipment intended solely for use by the handicapped and necessarily modified to safely accommodate such users, are exempt from the requirement(s) applicable to those components. The supporting rationale for the specifications and requirements is extensively discussed.

**529. Mahajan, Bal, and others. Public Playground Equipment: Suggested Safety Requirements and Supporting Rationale for Swing Assemblies and Straight Slides. Washington, D.C.: National Bureau of Standards (DOC), Apr. 1978. 58p. Available ERIC. ED 182 057.

This memorandum report proposes a safety standard to reduce the frequency and severity of children's impacts with the suspended members of swing assemblies and falls from slide surfaces, under conditions of normal use and reasonably foreseeable misuse. The standard applies to swings and straight slides intended for use as public playground equipment. The following six topics are covered by the standard: (1) swing assembly structural integrity, (2) swing assembly moving impact, (3) straight slide surface incline, (4) straight slide surface exit region, (5) straight slide surface side height, and (6) straight slide ladders and stairways. Equipment of this type is typically located in play areas of parks, schools, institutions, multiple family dwellings, private resorts, recreation developments, and other areas of public institutional use. The safety standard does not apply to amusement park rides and equipment, equipment normally intended for sports use, or to home playground equipment. Supporting rationale for the standard is extensively discussed.

530. Meredith, M. Marjorie. Don't sell your trampoline. Journal of Physical Education and Recreation, v52 n8 p82-83 Oct. 1981.

While the trampoline reached its peak of popularity in the 1950s and 1960s, the frequency of accidental injuries prompted physical education departments to discontinue its use in student athletic activities. Safety guidelines are provided for reinstating the trampoline in recreational programs.

531. Micheli, Lyle J. Prevent children's sports injuries. PTA Today, v8 n5 p10-12, March 1983.

Children who actively take part in sports are susceptible to special injury risks because their bodies are still growing. Parents should keep both the child's individual physical and emotional makeup and the demands of the sport in mind when selecting an activity. Proper training methods and equipment are discussed.

532. Mileff, Edward, Ed. Playing safe. Journal of Physical Education and Recreation, v47 n4 p29-36, April 1976.

Specific suggestions are offered for reducing the risks in several vigorous activities.

533. Morehouse, C.A., Ed., and others. Critical areas in sports safety. Journal of Physical Education, Recreation & Dance, v54 n6 p45-55 June 1983.

Four articles examine important aspects of sport safety. Topics include: (1) risks of eye injuries in racquet sports and preventive measures; (2) ways to reduce gymnastics injuries; (3) safety in training areas; and (4) risk-management strategies to avoid legal liability. Guidelines for teachers are given.

534. Morehouse, Chauncey A. Exercise in the 70s -- implications for safer practices. Journal of Physical Education and Recreation, v52 n1 p63-66,76, Jan. 1981.

Precautionary measures that should be taken by individuals to provide for safer participation in a vigorous exercise program are outlined, including the need for physical examinations, physical conditioning and warm-up, proper clothing and equipment, and awareness of environmental hazards.

**535. Morehouse, Chauncey A., Ed. Sports Safety II, Proceedings of the National Sports Safety Conference, Chicago, Illinois, October 15-17, 1976. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation, 1977. 133p. Available ERIC. ED 144 973. Microfiche only.

In this conference on safety and sports, conducted by the American School and Community Safety Association, five major topics were discussed. The first item concerned injuries in physical activities, the prevention of injuries in sports and a report on a survey of athletic injuries and deaths. The second item covered was the subject of injury surveillance systems. The third topic discussed was issues and developments in sports safety in high school and college programs, as well as programs for women and general recreational programs. Standards in sports equipment and facilities, and programs to reduce serious athletic injuries was the fourth subject under discussion. In the concluding session, liability and litigation in competitive sports, informal sports, and recreation programs was discussed. Throughout the conference the responsibility of athletic coaches was emphasized.

**536. Mueller, Frederick O., and Carl S. Blyth. Annual Survey of Catastrophic Football Injuries, 1977-1983. January 1984, 16p. Available ERIC. ED 243 861.

Football injuries which resulted in permanent spinal cord injury are reported in this survey, part of a concerted effort by individuals and research organizations to reduce the steady increase of football head and neck injuries since the late 1950's. In additon to the reporting of injuries, this document describes steps taken to eliminate the occurrence of these types of injuries. A discussion is presented of the situations in which severe injuries have been sustained by players, and recommendations are given for reducing such injuries. Case studies are presented of catastrophic injuries resulting in quadriplegia in 11 high school football players and one college player.

537. National Sanitation Foundation. Swimming Pool Water Treatment Chemical and/or Processes. Ann Arbor, Mich.: National Sanitation Foundation, Feb. 1968. 42p. ED 025 905. Not Available ERIC.

Chemicals or processes used or intended for use, in the treatment of swimming pool water are covered. Minimum public health limits or acceptability in regard to toxicity, biocidal effectiveness, and chemical behaviour and analysis are presented. The appendices give guidelines to the scientific and statistically sound evaluations to determine the efficacy and safety of swimming pool water treatment chemicals or processes.

538. Orlowski, S.T., and J. Peng. Air-Supported Structures. Toronto: Ontario Ministry of Education, School Planning and Building Research, 1972. 16p.

Includes discussions of the principle, foundation, floor, fabric envelope, mechanical equipment, heating, lighting, door, cost, summary of advantages and disadvantages, survey of opinions from owners and users of existing air-supported structures.

539. Outdoor Education Safety Guide. Victoria, B.C.: British Columbia. Ministry of Education, Science and Technology. Division of Policy Development, 1979.

**340. Park, J., and J.A. Arnold. Protective athletic equipment. Journal of the Arkansas Medical Society, v74 n5 p202-204, Oct. 1977. NIOSH-00074480.

The protective and preventive role of sport equipment, particularly the ones used in football is discussed. No team sport in the world has an incidence of injury higher than American football. It is estimated that the average high school boy participating a full season of play has a 20% chance of injury and an 8% chance of serious injury. In football, the head has to be protected against low, intermediate, and high velocity impact blows. In the 1930s, leather helmets were introduced with internal suspension. Helmets with a webbed suspension system appeared around 1950. In the 1970s, helmets with rigid outer shells with sophisticated pneumatic and hydraulic systems have appeared. Some studies have shown that there is no correlation between fit, condition, or age of the helmet and incidence of head or neck injuries. Face guards, mandatory since 1960, provide primary protection from direct blows to the mouth, nose and facial structures. Shoulder pads provide protection to the neck, shoulder and upper trunk. Other protective equipment and the steps being taken by research and design organizations to improve them are also discussed.

341. Penman, Kenneth A., and Frances R. Niccolai. Playing it safe: part I. American School and University, v57 n8 p36-38, April 1985.

The first of a series of articles explains the legal principles of tort liability, waiver of liability, comparative negligence, assumption of risk, and contributory negligence. Summarizes the kinds of cases going to court involving sport facility design and operation.

342. Penman, Kenneth A., and Frances R. Niccolai. Playing it safe: part II. American School and University, v57 n10 p42,44-45, June 1985.

Explains how to prevent outdoor sports injuries; discusses related litigation and specific cases involving playing field turf, tennis, skiing, and pools; and sets out facility design and maintenance considerations and recommendations. A sidebar provides information about injury insurance available to NCAA schools. Part I of this article appeared in the April 1985 issue of American School and University.

543. Riley, Catherine B. The vital role the school plays in preventing athletic injuries. Journal of School Health, v48 n2 p97-9, Feb. 1978.

544. Rist, Marilee C. Learn from this school sports tragedy. Executive Educator, v6 n8 p22, Aug. 1984.

Traces the death of a student athlete to deficiencies in the Yonkers, New York, athletic program. Includes evaluation questions based on actions later required of the Yonkers schools.

*545. Robbins, Mel. Duty of care. Education Canada, v16 n2 p4-11, Summer 1976.

Describes the case of an injured student and a $1.5 million suit against the teacher, principal and board.

546. Roy, Steven. The use of drugs in sports. In: Professional Preparation in Athletic Training. Proceedings of the Professional Preparation Conferences: National Athletic Trainers Association. 1982. 9p. ED 221 476. Not available ERIC.

Indications, precautions, contraindications, and side effects of drugs most frequently used by athletic trainers in treating injuries are discussed: (1) aspirin; (2) arylalkanoic derivatives; (3) butazolidin and tandearil; (4) corticosteroids; (5) oral corticosteroids; (6) muscle relaxants; (7) analgesics; (8) cold medications; (9) antidiarrheal agents; (10) medications suitable for constipation; (11) antifungal agents; (12) medication for exercise-induced asthma; (13) treatment for aphthous ulcers; (14) anabiolic steroids; and (15) amphetamines.

**547. Rutherford, George W., Jr. HIA Hazard Analysis: Injuries Associated with Public Playground Equipment. Washington, D.C.: Consumer Product Safety Commission, Aug. 1979. 61p. Available ERIC. ED 184 710.

This report provides an overview of public playground equipment injuries, identifies risks associated with different types of equipment and surfaces, and examines the possible effects of approaches to reducing these injuries. Findings include the following: (1) falls are the most common type of playground equipment accident, (2) the proportion of all injuries which involved each of the major types of playground equipment (swings, slides, climbers, etc.) is roughly equivalent to the proportion of all playground equipment represented by each major type, (3) falls to paved surfaces account for a disproportionately high number of injuries and severe injuries relative to the amount of paved surfacing in use, (4) about five percent of total accidents involve either malfunctioning or broken equipment, (5) equipment modifications might have reduced injuries by 55,000 in a one year period, and (6) equipment spacing and playground layout and design may account for as many as 8,300 injuries. In this study, analyses by hazard pattern and by type of equipment were conducted. Study results for location, equipment condition and material as well as deaths related to public playground equipment are reported. Data tables, an analysis of technical requirements submitted by the National Bureau of Standards, study methodology, and a list of 293 special study cases are appended.

548. Ryan, Allan J. Prevention of sports injury: a problem solving approach. Journal of Health, Physical Education and Recreation, v42 n4 p24-9, April 1971.

*549. Stirling, David R. Asthma and physical education. Promotion, v28 n1 p8-10, Fall 1983.

Recognizing that asthmatic children are at a distinct disadvantage in regular physical education classes, the author offers suggestions on modifications physical education teachers can make to encourage and involve children with asthma.

550. Sweeney, Theodora B. Human beings and playgrounds. Journal of the NAWDAC, v40 n3 p92-95, Spring 1977.

The problem of playground equipment safety is far more complex than first appears. Children often use their imaginations and the equipment in ways which manufacturers, teachers and parents never foresaw. The penalty for such imaginative miscalculations is far too high.

551. Sweeney, Theodora Briggs. Warning: children's playground may be harmful to their health. PTA Today, v8 n2 p21,23, Nov. 1982.

Children can suffer serious injuries in falls from standard playground equipment, especially if they land on a hard surface. Parents can: (1) form safety committees; (2) demand safer playground surfaces; (3) remove equipment deemed hazardous according to Consumer Product Safety Commission guidelines; and (4) support the purchase of safer equipment.

*552. Take danger out of adventure playgrounds. Education B.C., v1 n5 p2, May 1971.

This article briefly presents the recommendations of a study on the safety aspects of adventure playground equipment.

553. Torg, Joseph S., and Theodore Quedenfeld. Effect of shoe type and cleat length on incidence and severity of knee injuries among high school football players. Research Quarterly of the AAHPER, v42 n2 p203-11, May 1971.

554. Trimble, R. Thomas. Playscape safety. Journal of Physical Education and Recreation, v50 n6 p49-50, June 1979.

Since a more imaginative playground landscape induces more children to participate in play activities, increased safety precautions must be taken by school and recreational personnel.

555. Update: playground safety tied to people, not equipment. Educational Product Report Number 30, v4 n3 p6-7, Dec. 1970.

556. Wallach, Frances. Keep the dragon off your playground. American School and University, v50 n5 p26-8, Jan. 1978.

In terms of safety concerns, school should be directly involved in the selection and maintenance of playground equipment.

557. Warrell, Eileen. Safety in using gymnastic equipment. Journal of Physical Education and Recreation, v49 n7 p42-43, Sept. 1978.

From the first gymnastic lesson, children should be taught to be responsible for their actions in regard both to their own safety and that of others.

558. Waterloo Public Interest Research Group. Public Informational Meeting on 2,4-D. Waterloo, Ontario: Waterloo Public Interest Research Group, University of Waterloo, Ontario, 1979.

A group of parents in Northumberland County became concerned about spraying of their children's schoolyards with 2,4-D during school hours. They formed an organization and convinced a large number of school boards to discontinue spraying.

559. Weidner, Geoff. Physical education teachers coached on safety and legal risks. Phys Ed News, v10 n2 p12-13, Ja. 1982.

**560. Weldon, Gail. The Athletic Trainer: Necessity or Luxury? 1977. 6p. Available ERIC. ED 151 302.

This article emphasizes the importance of including an athletic trainer who is a qualified sports medicine professional in organized school sport programs, particularly football. Educational requirements for persons who wish to go into this profession are outlined, as well as employment opportunities.

**561. Wilkinson, Paul F., and Robert Lockhart. Safety in Children's Formal Play Environments. Toronto: Ontario Ministry of Culture and Recreation, Ontario Recreation Society, March 1976. 119p. Available ERIC. ED 208 940.

This study was designed to examine the issue of the safety of children's formal play environments. Safety was defined in terms of morbidity and mortality data. Protection and safety education were considered the prime factors in accident prevention while the goal of a safety program was considered to be the minimizing of injuries. Several data gathering techniques were used: in-depth personal interviews with persons planning and providing playgrounds; telephone interviews with similar personnel in other agency settings and in the federal government; letters requesting the assistance of recreation researchers and personnel; examination of accident records; review of literature on safety; and review of literature on legal responsibility. Accidents attributable to playground equipment were found to account for less than 2 per cent of all children's accidents and to account for very few deaths. Many accidents listed as playground accidents were found to be unrelated to playgrounds per se. Few accidents were attributable to equipment problems, although certain types of swinging equipment were associated with a significant increase in accidents. Surface materials were the most serious causal factors in playground accidents. It is strongly suggested that performance standards for playground equipment be adopted. Recommendations regarding liability and suggestions for further research are given.

SCIENCE LABS

*562. Agban, Jim. Alphabetical problems of chemical storage. *Crucible*, v11 n4 p13-15, June 1980.

Chemical reactions which can occur when substances are stored in alphabetical order are documented. Explosions can occur when vapours of certain chemicals come into contact with other nearby chemicals.

*563. Agban, Jim. Comments on safe chemical storage. *Crucible*, v11 n3 p4-6, May 1980.

The author suggests that chemicals be stored in a separate storage area, not in the lab itself. Conditions for a safe storage area are outlined. Categorization and labelling are discussed.

*564. Agban, Jim. Cost-saving procedures for disposal of chemicals by licensed companies. *Crucible*, v14 n1 p22-23+, 1982.

The author suggests procedures to be followed in co-ordinating the technical capabilities of science departments and those of disposal companies hired to dispose of chemical wastes which cannot be otherwise handled.

*565. Agban, Jim. Review of safety-related laboratory specifications and recommendations. *Crucible*, v11 n6 p4-7, Oct. 1980.

A quick reference to existing safety-related laboratory specifications is provided. Occupant load, means of egress and exits, utilities, ventilation and storage are discussed.

**566. Alabama State Dept. of Education. *Laboratory Safety Manual for Alabama Schools. Bulletin 1975. No. 20*. Montgomery: Alabama State Dept. of Education, 1975. 31p. Available ERIC. ED 155 044. Microfiche only.

This document presents the Alabama State Department of Education guidelines for science laboratory safety, equipment, storage, chemical safety, rocket safety, electrical safety, safety with radioisotopes, and safety with biologicals. Also included is a brief bibliography, a teacher's checklist, a listing of laser facts and regulations, and a listing of Alabama laws relative to safety goggles.

567. Allen, Ralph O. Waste disposal in the laboratory: teaching responsibility and safety. Journal of Chemical Education, v60 n3 pA81-A85 March 1983.

Discusses the generation, collection, and disposal of hazardous and other wastes in the chemistry laboratory. Offers suggestions related to these three areas to provide a safe teaching environment, including minimizing amounts of reagents used (and potentially wasted) by scaling down experiments.

568. Altman, Stephen. Guidelines to chemical hazard evaluation. Journal of Chemical Education, v55 n3 p140-4, March 1978.

Reviews responsibilities for persons using chemical substances which are potentially harmful.

569. Anderson, D.H., and others. A cleanup procedure for handling mercury spills. Journal of Chemical Education, v55 n2 pA74-8, Feb. 1978.

Describes a zinc-sawdust mixture effective for cleaning up mercury spills and presents an experiment to illustrate the mixture's effectiveness.

570. Andrew, H.G. Safety and safeguards in the laboratory. Education in Science, n61 p32, Jan. 1975.

Indicates dangers inherent in the use of polythene or polypropylene sinks and presents alternatives to their use.

571. Andrew, H.G. Safety and safeguards in the laboratory: safer hydrogen. Education in Science, n60 p33, Nov. 1974.

Describes a method for the preparation of hydrogen gas which is safer than conventional procedures. The procedure and equipment are described in detail.

*572. Angus, Ronald M. Contact lenses at work. Crucible, v14 n4 p13-14+, 1983.

The pros and cons of wearing contact lenses in the laboratory environment are discussed. The author concludes that many of the commonly held reservations regarding contact lenses in the lab are misconceptions. A solution to the controversy might be better training in proper eye protection methods with particular emphasis for those who wear contact lenses on the promptness of lens removal and thorough irrigation in the event of an accident.

573. Armour, M.A., and others. Safety in the chemical laboratory: tested disposal methods for chemical wastes from academic laboratories. Journal of Chemical Education, v62 n3 pA93-A95, March 1985.

Describes procedures for disposing of dichromate cleaning solution, picric acid, organic azides, oxalic acid, chemical spills, and hydroperoxides in ethers and alkenes. These methods have been tested under laboratory conditions and are specific for individual chemicals rather than for groups of chemicals.

**574. Austin, C.M., C.S. Rohrer, and R.L. Seifert. Explosive hazards of aluminum-liquid oxygen mixtures. Journal of Chemical Education, v36 n2 p54-57, Feb. 1959. NIOSH-00031234.

Experiments were made in barricaded cells to determine the explosive power and extreme hazard of powdered aluminum-oxygen mixtures used in schools as a classroom demonstration of vigorous oxidation of metals in a high concentration of oxygen. A brief summary of the thermal theory of explosions is also presented. The aluminum-liquid oxygen mixture must be considered a high explosive. Ignition of this mixture by candle flame probably in no case causes immediate detonation. However, the combustion itself can create the critical conditions that produce detonation. Because of the many variables involved and the difficulty of controlling them, no one can with certainty carry out this combustion with no danger of detonation. These statements apply equally to any experiment involving a mixture of liquid oxygen and oxidizable materials. Though the probability of detonation may be low with small amounts of aluminum or other oxidizable material and with mild initiating conditions, it is not zero and therefore these experiments should NEVER be used for classroom or public demonstration unless facilities are available to demonstrate safely the detonation of any high explosive.

575. B.C. Ministry of Education. Science Safety Manual. Victoria: Ministry of Education, 1984.

576. Baum, Rudy. Chemical safety: molten salt baths cited as lab hazards. Chemical and Engineering News, v60 n41 p29, Oct. 11, 1982.

Discusses danger of explosions with molten salts baths, commonly used as heat-transfer media. One such explosion involved use of a bath containing 3-lb sodium nitrite and 1-lb potassium thiocyanate. Although most commercially available mixtures for heat transfer contain oxidizers, a reducer (thiocyanate) was included which possibly triggered the explosion.

577. Bayer, Richard. Toxic vapors and ventilation parameters: evaluating the laboratory atmosphere. Journal of Chemical Education, v59 n12 pA385-89, Dec. 1982.

A significant amount of scientific work is done in laboratories with limited ventilation capabilities. To operate at "acceptable risk", an understanding is needed of what ventilation systems can/cannot do. A simple experiment is described which assesses conditions under which specific experiments should be performed and serves to introduce chemical/health principles.

578. Black, D.A., and G.C. Anderson. The storage and handling of chemicals. B.C. Science Teacher, v21 n2 p67-70, Winter 1979.

579. Black, Doug. Safety and class size -- what can you do? B.C. Science Teacher, v19 n3 p27, Mar. 1978.

Discusses the legal responsibilities of a science teacher.

580. Borrows, Peter, and Richard Turner. How safe is science in schools? New Scientist, v13 p12-15, Sept. 1984.

Safety regulations for school science are going unobserved for lack of funds; but school is the ideal place to instill a lifelong awareness of potential hazards.

581. Borrows, T.P. The health and safety act -- and schools. Education in Chemistry, v12 n6 p168-169, Nov. 1975.

Describes some of the problems likely to be encountered by British science teachers and school science departments in the implementation of laboratory standards under the Health and Safety at Work etc. Act 1974.

582. Breedlove, C.H., and John Softy. The explosive potential of Tollens' Reagent. Journal of College Science Teaching, v12 n4 p281, Feb. 1983.

Reports on an explosion that occurred using Tollens' reagent, emphasizing that students should prepare the reagent immediately before use and discard it immediately after use by flushing it down the drain. States that under no conditions should Tollens' reagent be stored.

583. Bremmer, Moyra. Hazards of school science. New Scientist, v69 n991 p550-552, Mar. 11, 1976

Discusses safety in school laboratories and school lab accidents in Britain and suggests ways of reducing potential hazards of school science.

584. Brennan, John Wesley. An Investigation of Factors Related to Safety in the High School Science Program. University of Denver, Ed.D. Dissertation, 1970. 196p. ED 085 179. Not available ERIC.

The purpose of this study was to identify: (1) the types of accidents and the areas in which they occur in the high school biology, chemistry, and physics laboratory; (2) the contributing factors that cause accidents; and (3) the preventive measures practiced, and the success of the preventive measures. Four hundred and thirty science teachers representing all fifty of the United States were sent questionnaires to gather the data. Data were analyzed for information for relationships of laboratory accidents with teaching experience, school enrollment, class enrollment, laboratory space, laboratory types, and individual and general laboratory stations. The second portion of the questionnaire was designed to procure information regarding: (1) the relationship of laboratory hazard areas to laboratory accident, (2) identification of contributory factors, and (3) identification of successful laboratory procedures. The general and statistical data provided significant relationship information leading to the conclusions: (1) generally, remedial groups have less accidents than others and advanced placement groups in general had the most; (2) class enrollment had a significant relationship to laboratory accidents as well as to laboratory space (3) fewer accidents occurred when individual laboratory stations existed; and (4) chemistry was more prone to laboratory accidents.

585. Brown, Walter R. Hidden hazards in the science laboratory. Science and Children, v11 n5 p11-13, Jan/Feb. 1974.

Describes precautions that should be taken and procedures that should be followed to minimize the risk of accidents in the school science laboratory.

586. Bullock, A. Explosion hazard: lithium oxidation. School Science Review, v57 n199 p311-314, Dec. 1975.

Suggests that Experiment 13.2 (c) of the Nuffield O-Level Chemistry Course be banned since the oxidation of lithium under very humid conditions can cause an explosion.

587. CAL/OSHA officials urge schools to rid laboratories of carcinogens. Occupational Safety & Health Reporter, v6 n17 p501, September 23, 1976.

588. Canada. Health and Welfare. Environmental Health Directorate. Guidelines on Toxic and Hazardous Chemicals Used in Educational Institutions. Ottawa: Canadian Government Publishing Centre, 1980. 37p.

589. Carleton, Terry S. Begone odious benzene, carbon tet, and chloroform. Journal of Chemical Education, v59 n6 p530-31, June 1982.

Suggests alternatives for benzene, carbon tetrachloride, and chloroform and offers safety precautions when these solvents must be used.

590. Carter, D.E., and Quintus Fernando. Resource paper: chemical toxicology: part 1. Organic compounds. Journal of Chemical Education, v56 n5 p284-88 May 1979.

This article brings to the attention of chemists the toxicological properties of several important classes of organic compounds.

**591. Chaney, Donna J. An Annotated Bibliography of the Literature Dealing With the Hazardous Chemicals Used in the Chemistry Laboratory. Nov. 1984. 43p. Available ERIC. ED 252 379.

On the premise that many laboratory instructors lack knowledge about chemical toxicity, this study investigated three areas: (1) chemicals used in the academic laboratory which pose a health hazard; (2) ways of reducing toxicity in the laboratory (with attention to the apparent lack of teacher training which contributes to the cause of the problem and to suggestions for monitoring units and facility devices to reduce the hazard); and (3) state and federal regulations and resource materials for the proper handling and disposal of hazardous chemicals. An annotated bibliography is included which examines each of these areas. Findings clearly establish the need for teachers to be informed of the chemicals which are potential health hazards and indicate that educating laboratory instructors to the hazards of certain chemicals is the initial approach to reducing the dangers of chronic poisons in the classrooms. Recommendations based on these and other findings include removing all carcinogenic chemicals from classroom and storage areas, formulating and using a predetermined waste disposal program before an experiment is performed, and having all laboratory instructors participate in a formal health safety program.

592. Chem corner: lab safety. B.C. Science Teacher, v21 n3 p32-35, Spr. 1980.

593. Chemical Data Sheets. Toronto: The Board of Education for the City of Toronto, 1982. Three-volume manual.

This manual contains an alphabetical collection of looseleaf user information sheets. Each page contains information relevant to one particular chemical substance, identifying the chemical composition of each brand name product used or stored in the city's schools. Also included is information on potential hazards, handling and emergency procedures for many of the products.

594. Clausz, John C., and others. Safety in the chemical laboratory: atmospheric formaldehyde levels in an academic laboratory. Journal of Chemical Education, v61 n4 pA121-22,A125, April 1984.

Determined whether improved ventilation and use of "formaldehyde-free" biological specimens could reduce the levels of formaldehyde in air to which students and faculty would be exposed. Both methods were found to be effective in reducing formaldehyde levels in air.

595. Coble, Charles R., and Paul B. Hounshell. A framework for evaluating chemical hazards. Science Teacher, v47 n5 p36-40 May 1980.

Lists questions that teachers should ask relating to use of all chemicals in the school laboratory, as well as chemicals with known and suspected dangerous properties. Tables list Occupational Safety and Health Administration (OSHA)-defined carcinogens, American Chemical Society-defined teratogens, suspected carcinogens, and other hazardous substances.

596. Coffee, Robert D. Safety in the chemical laboratory. Journal of Chemical Education, v49 n6 pA343-A349 June 1972.

The author discusses a system for establishing the relative potential of a chemical to release energy suddenly and to indicate release. This system is applicable to chemical storage and transportation and is based upon three simple tests requiring a minimum sample: (1) computation, (2) impact sensitivity, and (3) thermal stability.

597. Cook, J.D. Disposal of toxic and hazardous chemicals. Education in Chemistry, v12 n6 p182-184, Nov. 1975.

Discusses types of laboratory waste materials and methods for their safe disposal.

598. Cooper, D. HAZCHEM and the transportation of chemicals. Education in Chemistry, v17 n3 p88-89, May 1980.

A coding system, with flow charts, for "Hazchem" provides an application of the knowledge of chemical behavior to emergency situations.

599. Corbridge, James N., Jr., and Aaron R. Clay. Laboratory teachers and legal liability. Physics Teacher, v17 n7 p449-54, Oct. 1979.

Using hypothetical lawsuits as examples, the more common rules of law which define the acceptable conduct of a physics teacher in the classroom, laboratory, and general school area are examined.

**600. Cost, Helen, and others. Oakland County Science Safety Series: Reference Guide for Chemistry. Pontiac, Mich.: Oakland County Schools, 1977. 121p. Available ERIC. ED 174 474. Microfiche only.

This reference guide is intended to organize and suggest acceptable practices and procedures for dealing with safety in the area of chemistry instruction. It is intended as a resource for teachers, administrators and other school staff both in planning for science activities and in making daily decisions concerning safety. Sections include discussion of safety responsibility, safety training for students, chemicals, gases, heat sources, working with glass and plastics, accident prevention, and first aid. Several appendices deal with specialized considerations.

601. Council of State Science Supervisors. School Science Laboratories: A Guide to Some Hazardous Substances. Washington, D.C.: U.S. Consumer Product Safety Commission, 1984. 60p.

A supplement to the National Institute for Occupational Safety and Health Manual of safety and health hazards in the school science laboratory.

602. Danger from pathogens in school science. Occupational Health, v29 n10 p412-413, Oct. 1977.

603. Dean, Robert A., and others. Safety in the Elementary Science Classroom. Washington, D.C.: National Science Teachers Association, 1978. 25p. ED 176 979. Not available ERIC.

This safety guide for elementary school science teachers who plan science activities or laboratories for their students, presents information in the form of a flip chart that can be posted in the classroom and referred to in an emergency. Space is provided for emergency telephone numbers. A safety checklist is given for the teacher. Topics include: (1) Animals and Plants in the Classroom; (2) Eye Protection; (3) First Aid; (4) Field Trips; (5) Fire Prevention and Control; (6) Storage and Labeling; and (7) Safe Use of Equipment and Materials.

**604. Dean, Robert A., and others. Safety in the Secondary Science Classroom. Washington, D.C.: National Science Teachers Association, 1978. 108p. Available ERIC. ED 164 250. Microfiche only.

This booklet is made available by the National Science Teachers Association to provide district safety officers, school principals, science department heads, and secondary school science teachers with information on safety in schools, especially in science classrooms. The range of information includes Occupational Safety and Health Administration, first aid, general and specific instructions to teachers and students in biology, physics, chemistry, and life/physical science classes, and safe practices to follow for extra curricular activities. The publication is a compilation of recommended practices in the area of science taken from many sources throughout academia and industry. The booklet includes a recommended standard student accident report format and a bibliography for further reference.

605. DeLorenzo, Ronald. Introducing laboratory safety. Journal of College Science Teaching, v15 n2 p113, Nov. 1985.

Presents a simple, 10-item quiz designed to make students aware that they must learn laboratory safety. The items include questions on acid/base accidents, several types of fire extinguishers, and safety glasses. Answers and some explanations are included.

606. Direction de l'hygiène du milieu, Direction générale de la protection de la santé,. Mesures de sécurité recommandées pour la sélection et l'utilisation de dispositifs à décharge pour démonstration dans les écoles. Rédigé par W.M. Zak et E. Rabin. Ottawa: Santé et Bien-être Social Canada, 1979. 31p.

Dans les laboratoires scientifiques modernes des établissements d'enseignement, on se sert d'une variété d'équipement aux fins de démonstration et d'expérimentation. Un grand nombre des appareils utilisés peuvent émettre des rayons X, des micro-ondes et d'autres radiations dangereuses dont le niveau dépasse le seuil considéré acceptable. Une catégorie d'appareils de démonstration très répandus dans les écoles est le tube à décharge. Certains de ces tubes, en particulier le tube à cathode froide, peuvent émettre des rayons X à des niveaux très élevés. A moins de les utilser avec précaution, c'est-à-dire en observant les meures de sécurité convenables en matière de radiation, les élèves peuvent subir des expositions qui dépassent les niveaux maximums recommandés par la Commission internationale de protection contre les radiations. Rédigé spécialement à l'intention des membres du personnel enseignant chargé des sciences et d'autres personnes qui se servent de dispositifs à décharge aux fins de démonstration, le document présente des conseils pour la sélection et l'emploi des appareils afin de réduire au minimum les risques pour les utilisateurs et les élèves. Il contient des renseignements utiles sur les mesures de sécurité à observer lorsqu'on effectue des démonstrations ou des expériences. De toute évidence, il n'est pas possible d'indiquer dans un document du genre toutes les situations possibles; par conséquent, il faut continuer à faire preuve de jugement et modifier au besoin les recommandations en tenant compte de circonstances inhabituelles. Pour obtenir une interprétation ou d'autres détails sur n'importe quel renseignement contenu dans le document, prière de communiquer avec le Bureau de la radioprotection à Ottawa.

607. Dombrowski, JoAnne Morgan, and Ray R. Hagelberg. The Effects of a Safety Unit on Student Safety Knowledge and Behavior. Science Education, v69 n4 p527-33, July 1985.

> Determined that an instructional unit on laboratory safety could increase student safety knowledge and reduce the number of unsafe behaviors. A list of unsafe behaviors which were observed with the 333 students is included. A recommendation that positive attitudes toward safety be developed is given.

608. Dunkleberger, Gary E., and Sue Snyder. Safety tips: safety in the classroom: a model for training science teachers. Journal of Chemical Education, v62 n1 p73-74, Jan. 1985.

> A workshop was designed to (1) train teachers to become experts on chemical safety and storage; (2) examine and evaluate chemical storage in 12 Carroll County (Maryland) schools; and (3) develop a safety guide for all county science classrooms. Development, implementation, evaluation, and implications of the workshop are addressed.

609. Dutt, G.C., and others. Safety Procedures for the Use of Demonstration Laser Devices in Schools = Mésures de sécurité relatives à l'utilisation de dispositifs lasers de démonstration dans les écoles. Report of the Working Group on Radiation Surveillance to the Federal-Provincial Sub-committee on Environmental Health. Ottawa: Health and Welfare, Health Protection Branch, 1976. v.p.

> This document has been specially prepared to assist school teachers, university professors and other persons using "low powered" demonstration laser devices. The text has been written in the form of a code of practice or safety code and contains useful information on safe procedures that should be carried out when demonstrating laser devices. Interpretation or elaboration on any point can be obtained by contacting the Radiation Protection Bureau of Health and Welfare Canada in Ottawa. = Cette publication à été spécialement préparée pour aider les membres du personnel enseignant, les professeurs d'université et les autres personnes qui utilisent des lasers de démonstration de faible puissance. Le texte, rédigé sous forme de code de pratique ou de code de sécurité, contient des renseignements utiles sur les mesures de sécurité qui devraient être observées dans l'utilisation des dispositifs lasers de démonstration. On peut obtenir des éclaircissements ou de plus amples informations en communiquant avec le Bureau de la radioprotection de Santé et Bien-être social Canada à Ottawa.

610. Dzwiniel, M. A compromising situation. Alberta Science Teacher, v2 n1 p18-22, Dec. 1981.

611. Dzwiniel, M. Slaying the chemical storage dragon. Alberta Science Teacher, v1 n2 p23-25, Mar. 1981.

612. Dzwiniel, M. Waste watching. Alberta Science Teacher, v1 n3 p25-28, June 1981.

**613. Ehrenkrantz, T.E. Safety in the chemical laboratory XXVII. A chemical laboratory safety symposium for high school students. Journal of Chemical Education, v43 n6 pA513, A515-A516,A518, June 1966. NIOSH-00007005.

Description of a one day symposium conducted by the American Chemical Society Council Committee on Chemical Safety to promote safety in high school chemistry laboratories.

614. Environmental Health Directorate, Health Protection Branch. Recommended Safety Procedure for the Selection and Use of Demonstration-type Gas Discharge Devices in Schools. Drafted by W.M. Zak and E. Rabin. Ottawa: Health and Welfare Canada, 1979. 31p.

Modern science laboratories in educational institutions employ as teaching aids a variety of equipment for demonstration and experimentation. Many of the devices used are capable of emitting X-rays, microwaves or other potentially hazardous radiations at levels greater than considered acceptable. One class of demonstration device in widespread use in schools is the gas discharge tube. Some gas discharge tubes, in particular the cold cathode type, can emit X-rays at significantly high levels. Unless such tubes are used carefully, and with due regard for good radiation safety practices, they can result in exposures to students that are in excess of the maximum levels recommended by the International Commission on Radiological Protection. This document has been specially prepared to assist science teachers and others using demonstration-type gas discharge devices to select and use such devices so as to present negligible risk to themselves and to students. It contains useful information on safety procedures that should be followed when performing these demonstrations or experiments. Interpretation or elaboration on any point in this document can be obtained by contacting the Radiation Protection Bureau in Ottawa.

615. Everett, K., and E.W. Jenkins. A Safety Handbook for Science Teachers. London, England: John Murray Publishing Co., 1977. 100p. ED 159 035. Not available ERIC.

This publication is a safety handbook designed for science teachers of elementary and secondary schools. In an effort to insure prevention of accidents in school laboratories, it advocates careful planning, adequate experimental design, and the acquisition of correct laboratory techniques on the part of the teacher. The handbook gives instructions to be followed in case of emergencies, and recommendations for safety in school laboratories and workshops. It also explains a number of safety issues that deal with biological sciences, lists precautions against the outbreak of fire, and discusses a few measures for first aid treatment. The book includes a special section on the teacher and the law, and a selected bibliography. The appendix contains a comprehensive list of the major hazards in laboratory safety to serve as a source of reference for teachers and students.

**616. Folks, John, and others. Safety Precautions for Science. Oklahoma City: Oklahoma State Dept. of Education, 1982. 64p. Available ERIC. ED 214 757.

Safety information is discussed and outlined in this guide. Areas include: (1) general laboratory safety rules; (2) general rules and guidelines for animals in the elementary classroom; (3) general guidelines for the physical sciences; (4) general rules for using animals in investigations, with specifics on the care and handling of mammals, reptiles, insects/spiders, protozoans, and preserved specimens; (5) precautions when using plants; (6) earth science guidelines; (7) field trip guidelines; (8) alphabetical list of hazardous or incompatible chemicals likely to be encountered by students; (9) special instructions relating to glass, x-ray equipment, model rockets, radioisotopes, non-ionizing radiation, lasers, and electricity and electronic equipment; (10) storage, labeling, and disposal of chemicals; (11) list of basic first aid supplies; (12) first aid procedures; and (13) laboratory safety checklist.

617. Freifeld, Milton. Safety in the chemical laboratory: what's in the air? how much is too much? Measurement of toxic gases, vapors, and particulates -- limits of exposure. Journal of Chemical Education, v59 n11 pA351-A354, Nov. 1982.

Discusses methods of measuring organic vapors, various compounds, and particulates in laboratory atmospheres, reviewing criteria for safe levels.

618. From laboratory safeguards sub-committee. Education in Science, n83 p19-21, June 1979.

Various safety precautions for the science teaching laboratory are discussed, including rules for pupils, hazards of some reagents, and electrical safety.

619. From the laboratory safeguards committee. Education in Science, n85 p30-31, Nov. 1979.

Several potential safety problems are identified relative to science teaching: the use of bottled gas or alcohol lamps as heat sources, the hazards of Millon's Reagent for testing for proteins, and the use of silicon tetrachloride to demonstrate properties of chlorides. Science teachers are also warned about potentially dangerous procedures suggested in "Modular Science -- Health and Hygiene."

620. Gallagher, Barbara. Safety tips: the ACS chemical health and safety referral service. Journal of Chemical Education, v61 n7 p650-51, July 1984.

This article, based on a speech presented before the Division of Chemical Health and Safety, American Chemical Society National Meeting (Washington, DC, August 31, 1983), describes an American Chemical Society (ACS) service which helps individuals not familiar with the resources of safety information. The service, which provides referrals to literature, films, educational courses, or organizations that can provide answers, exists to help in complying with legislation and dealing with all aspects of chemical health and safety.

**621. Gerlovich, Jack A., and Gary E. Downs. Better Science Through Safety. Ames: Iowa State University Press, 1981. 146p. Available ERIC. ED 216 889. Microfiche only.

Following a brief description of the major components found effective in school safety programs (safety management, education, and services) and data on school accidents in Iowa, this book addresses various aspects of safety related to science instruction, emphasizing that responsibility for safety must be shared by both teacher and students. Areas discussed include: (1) legal liability (definition of pertinent terms, teacher responsibilities, and case studies); (2) eye protection; (3) safety issues and concerns in biology, chemistry and physics settings; (4) safety concerns, considerations, and measures related to field trips and associated activities, the physical plant, science facilities, student research projects, and handicapped students; and (5) accident/incident reporting systems. General and specific guidelines are provided for each of the major areas and related topics addressed. Appendices include checklists related to the areas, a chart of selected eye protectors, safety equipment (eye washes, safe pipettor, safe pipetting station, and a self-sterilizing inoculating loop), and general first-aid guidelines.

622. Goodenough, Trevor. Handling and storage of chemicals in secondary school laboratories. South Australian Science Teachers Journal, n792 p17-24, June 1979.

Discusses problems of handling, storage, and disposal of chemicals in Australian secondary school science laboratories, and suggests ways of reducing the potential hazards which exist.

623. Goodenough, Trevor. Safety and the present secondary science scene. South Australian Science Teachers Journal, n792 p11-16, June 1979.

Discusses some problem areas as they presently exist in many secondary school laboratories in Australia, and presents some views on how safety in science should be presented to the Australian students.

624. Gordon, Joseph, and others. Classroom ecology and safety. Journal of School Health, v42 n3 p178-81, March 1972.

Guidelines for handling animals in the classroom are presented.

625. A guide to laboratory safety. Journal of Chemical Education, v54 n1 p9-26, Jan. 1977.

Discusses precaution in handling laboratory chemicals and research animals. Gives references, suggested readings, and a table showing fire hazard properties of some flammable liquids.

626. Hall, Stephen K. Toxicology and chemical safety. Journal of Chemical Education, v60 n2 p145-46, Feb. 1983.

Topics addressed in this discussion of toxicology and chemical safety include routes of exposure, dose/response relationships, action of toxic substances, and effects of exposure to chemicals. Specific examples are used to illustrate the principles discussed. Suggests prudence in handling any chemicals, whether or not toxicity is known.

627. Hanssmann, Charles O. Safety is everyone's responsibility in the schools. Journal of Chemical Education, v57 n3 p203-05, March 1980.

Pinpoints common areas of neglect in considering science safety. Familiar hazards are discussed, with special consideration of improper chemical storage, old and unlabeled chemicals, and faulty circuits and equipment. An appendix lists basic safety rules and presents a checklist for general laboratory safety.

628. Hawcroft, D.M., and J.C. Stewart. The safe use of radioactive isotopes in teaching experiments. Journal of Biological Education, v8 n4 p213-215, Aug. 1974.

This article briefly discusses some of the dangers involved in the use of radioisotopes and includes a comprehensive list of precautions and laboratory rules for use during radiobiology experiments.

629. Holt, G. Practical tips for the safe handling of micro-organisms in schools. School Science Review, v56 n195 p248-252, Dec. 1974.

Outlines safe laboratory procedures for the handling of micro-organisms including aseptic technique, manipulation of cultures, and treatment of contaminated equipment. Identifies the principal hazard as the microbial aerosol, explains its possible effects, and describes the appropriate precautions.

**630. Investigation of Exposure to Formaldehyde from Preserved Biological Specimens. Status Report. Washington, D.C.: Consumer Product Safety Commission, 1982. 9p. Available ERIC. ED 229 228

This investigation of formaldehyde exposure in school laboratories, where its principal source is from preserved biological specimens, was undertaken because of concern over exposure levels reported in the literature. Information was obtained in two ways. A limited survey of schools was conducted to determine extent of students' use of preserved specimens. Various producers of preserved specimens were also surveyed to obtain information on sales, general industry practices, and availability of substitutes. Air measurements in classrooms where dissection was underway and specific information on specimens used, class size, and general ventilation in school laboratories/classrooms were obtained in another study. Among the results reported are findings that use of formaldehyde-preserved specimens exposes students/teachers to formaldehyde levels in excess of background exposure and that industry, aware of the toxicity problem, has developed new-technology packing media which significantly reduces such emissions.

**631. Irving, J.R. Safety in the chemical laboratory. XXXV. A laboratory safety orientation lecture for the first chemistry course. Journal of Chemical Education, v43 n3 pA215-A216+, March 1967. NIOSH-00007226.

A safety program is presented for the use of high school teachers who are about to introduce students to formal laboratory work. Topics covered are: general safety techniques; equipment identification; safety habits (wearing safety glasses and safety clothing, reading of reagent bottle labels, injury report); and special safety duty implications for the chemistry teacher.

**632. Irving, James R. How to Provide for Safety in the Science Laboratory. Washington, D.C.: National Science Teachers Association, 1968. 12p. Available ERIC. ED 027 220. Microfiche only.

This booklet contains an extensive checklist of statements and questions pertaining to safety precautions to be followed in school science laboratories. The planning of science facilities for optimum safety and the role of the teacher in providing for safety are also discussed. A separate section for dealing with mercury is also included. The appendix contains a bibliography of books and articles and a list of organizations concerned with school laboratory safety.

633. James, Walter A. Computerized Chemical Inventory Program. Toronto: The Board of Education for the City of Toronto, 1983.

This report proposes that the following measures would form an effective chemical inventory program: (1) compile master listing of chemicals in use in schools; (2) review the hazard rating of these chemicals; (3) supply each chemistry, physics and biology Department head with reference materials for chemicals; (4) expand "Hazardline" (a private computer data base) access to technical school's chemistry offices.

634. John, Gareth D. The exploding metals. School Science Review, v62 n219 p279-86, Dec. 1980.

Describes the use and handling of alkali metals in school laboratories and seeks to reexamine precautions which one may reasonably take before executing routine procedures since their use, even by skillful teachers, occasionally results in accidents in the form of violent explosions.

635. Johnson, James S. Carcinogen control in the chemical laboratory. Journal of Chemical Education, v58 n9 pA257-62, Sept. 1981.

Presents general and specific guidelines for handling carcinogens. Additional topics include: definition of potential occupational carcinogens; classification of carcinogens; inventory requirements; signs and labels for materials and laboratories; decontamination and disposal procedures; medical surveillance for employees working with controlled chemicals; and purchasing and receiving of toxic materials.

636. Jones, Hudson C., and Gerald C. Llewellyn. "Sign" language for safety. Science Teacher, v44 n9 p26-7, Dec 1977.

Information from a variety of sources on laboratory safety is pooled to propose a universal code. Along with caution, warning, and danger labels, a required use category is suggested.

637. Joye, E. Michael. Law and the laboratory. Science Teacher, v45 n6 p23-25 Sept. 1978.

Discusses teacher liability in the science laboratory. Cites specific court cases to illustrate points.

638. Kalra, R.M. Potential hazards in organic chemistry. Science Teacher, v36 n6 p62, Sept. 1969.

639. Kingston, David W. Contact lenses in the laboratory. Journal of Chemical Education, v58 n10 pA289-90, Oct. 1981.

Summarizes results of a three-item questionnaire returned by 43 Michigan institutions expressing views on wearing contact lenses in chemical laboratories. Questions focused on eye protection, type of protection, and use of contact lenses.

640. Kireef, A. Radioactivity. Alberta Science Education, v13 p52-77, Sept. 1974.

641. Kireef, A. Safety in the chemistry laboratory. ATA Science Newsletter, v9 p14-18, Jan. 1974.

642. Kizer, Franklin D. Design for safety. Science Teacher, v46 n6 p33-34, Sept. 1979.

Suggestions are given for safety precautions in the secondary school science laboratory. Emphasis is placed on fire safety and identification of particularly hazardous situations.

**643. Krajkovich, Joseph G. A Survey of Accidents in the Secondary School Science Laboratory. New Jersey Science Supervisors Association. May 1983. 26p. Available ERIC. ED 229 280.

A survey of 102 New Jersey secondary school science teachers, department chairpersons, and supervisors concerning their laboratory accident-rate was conducted during the 1981-82 school year. Results indicate that accidents occur on a weekly basis even among a sample of experienced teachers who were interested in safety. The number of accidents reported was 4,721, which is equivalent to 1.29 per teacher per week. Thirty-seven percent of the respondents reported a major accident had occurred in their teaching experience (one requiring a doctor's care). Other findings of importance were that laboratory facilities appear to be less than comprehensive in the area of eye safety and those teachers with advanced degrees and the most experiences have significantly fewer accidents. Questionnaire used in the survey, comments concerning survey question C2 ("Do you feel that authors forewarn you enough as to the safety of a proposed laboratory experiment?"), list of major accidents reported (from those included in the survey), and list of other accidents reported not included in the survey are provided in appendices.

644. Kurnath, Norbert T., and Marilyn C. Kurnath. Chemistry laboratory litigations: review and implications. Journal of Chemical Education, v58 n11 pA329-33, Nov. 1981.

Twelve court cases involving laboratory situations are reviewed in chronological order. Report includes five statements indicating when an instructor is not liable as well as guidelines to improve laboratory safety and provide some measure of liability protection for the instructor.

645. The labelling of chemicals. Education in Science, n82 p25-26, April 1979.

Describes the impact on chemistry laboratories and teachers in the United Kingdom of the Packaging and Labelling of Dangerous Substances Regulations 1978. These regulations require suppliers to label containers in particular ways.

646. Laboratory safety. Education in Science, n72 p19-21, April 1977.

Discusses issues raised by the English Health and Safety at Work Act, legislation regulating laboratory safety in industry and in schools in Great Britain.

647. Laboratory safety and chemical hazards. Journal of Chemical Education, v60 n1 p11-12, Jan. 1983.

Toxicology/chemical hazards, safety policy, legal responsibilities, adequacy of ventilation, chemical storage, evaluating experimental hazards, waste disposal, and laws governing chemical safety were among topics discussed in 10 papers presented at the Seventh Biennial Conference on Chemical Education (Stillwater, Oklahoma 1982). Several topics are considered in courses dealing with the subjects.

648. Laboratory Science Safety Guide. Victoria, B.C.: Department of Education, 1975. 10p.

649. Lance, R.C., and N.J. Kippenhan. Corrosive chemical hazards. Chemist-Analyst, v67 n1 p1-2, May 1978.

Precautions to be used with the handling of corrosive gases, liquids and solids are listed. Storage suggestions for the materials are provided.

*650. Letkeman, P. Safety in Science for Manitoba Science Teachers. Winnipeg: Manitoba Department of Education, 1973.

This curriculum support booklet for science teachers presents guidelines concerned with the broad area of safety in science. Chapter one discusses the safety program in general -- administrative, teacher and student responsibility. Chapters two, three and four deal with the chemistry, physics and biology laboratories in turn -- adequate facilities and equipment, proper housekeeping procedures, and laboratory techniques and hazards. Chapter five discusses science fairs, field trips, extracurricular projects, safety checks and safety color coding. An appendix lists further resource materials.

651. Lulashnyk, Lorne. Safety in the school science laboratory -- a valuable workshop. Manitoba Science Teacher, v20 n4 p23-26, Apr.-June, 1979.

**652. Lulashnyk, Lorne, and Janet Boonov. Safety in Science. Curriculum Support Series. Winnipeg: Manitoba Dept. of Education, 1982. 123p. Available ERIC. ED 219 258.

Since the major causes of accidents are carelessness and a negative or apathetic attitude towards safety, this guide was developed to facilitate safe, stimulating science laboratory activities by providing both general and specific safety information presented in 12 sections. Subject areas considered in these sections include: 1) administrator/teacher/student responsibilities for laboratory safety and legal liability for laboratory accidents (includes extensive guidelines and safety audit checklists); 2) fire; 3) safety equipment and systems; 4) precautions for handling glassware; 5) compressed air, gases, and aerosols; 6) cryogenics (extreme cold); 7) model rocketry and balloons; 8) home chemistry sets; 9) science fairs; 10) chemistry, focusing on handling and storage of chemicals; 11) physics, focusing on the safe use of electrical equipment, radioactive materials, non-ionizing radiation, and lasers; and 12) biology, focusing on microbiological techniques, use of animals, experiments, and poisonous plants, including a list of plants, toxic part(s), and symptoms. A bibliography, list of supplementary resources (films and charts), and three appendices (first aid, wind chill factor, and thunderstorm hazards) are also provided.

**653. Lynch, Mervyn A., and Lorna Offet. Science Safety Procedure Handbook. Edmonton, Alberta: Edmonton Catholic Schools, 197[illegible]. 66p. Available ERIC. ED 138 463.

This booklet outlines general safety procedures in the areas of: (1) student supervision; (2) storage safety regulations, including lists of incompatible chemicals, techniques of disposal and storage; (3) fire; and (4) first aid. Specific sections exist for elementary, junior high school, senior high school, in which special procedures are detailed for units of study at the appropriate level. Also included is the Edmonton Catholic School District's regulations regarding accidents in the school.

**654. Mann, C.A. Safety in the chemical laboratory. LVIII. Science experiment safety in the elementary school. Journal of Chemical Education, v46 n5 pA347-A351, May 1969. NIOSH-00007252.

Preliminary report on a survey to evaluate the safety hazards to students and teachers of science experiments recommended for elementary school. Twenty-two experiments are described; the results of the safety analyses are not included.

655. Mathews, Frederick J. Safety in the chemical laboratory: flameless organic teaching laboratories are safer. Journal of Chemical Education, v62 n2 pA43-A44, Feb. 1985.

The goal of many colleges is to make the organic chemistry laboratory completely flameless by using electric heating equipment. Benefits of eliminating the Bunsen burner, electrical heating equipment and accessories, hazards remaining in flameless laboratories, and design standards related to laboratory liability are the major topic areas discussed.

656. McCombie, T.F. Chemical hazard warning labels. Education in Chemistry, v12 n6 p175-177, Nov. 1975.

Describes chemical labeling standards that utilize explanatory symbols to identify hazardous substances.

**657. McDermott, John J. Guide for Science Laboratory Safety. Harrisburg: Pennsylvania State Dept. of Education, Bureau of Curriculum Services. 1981. 76p. Available ERIC. ED 211 332.

General and specific safety procedures and recommendations for secondary school science laboratories are provided in this guide. Areas of concern include: (1) chemicals (storage, disposal, toxicity, unstable and incompatible chemicals); (2) microorganisms; (3) plants; (4) animals; (5) electricity; (6) lasers; (7) rockets; (8) eye safety and protective eye devices; (9) equipment producing ionizing radiation; and (10) radioisotopes. Pertinent Pennsylvania laws are cited for appropriate areas. An appendix contains various items pertaining to laboratory safety considerations including lists of non-recommended chemicals, carcinogens and their synonyms, lists of radioisotopes and their sources, and rules and regulations of the United States Nuclear Regulatory Commission.

658. McDermott, John J., and Irvin T. Edgar. The picric acid episode -- an "isolated incident" that wasn't. Science Teacher, v46 n7 p35-36, Oct. 1979.

This is an account of the discovery of a potentially dangerous high explosive chemical on storeroom shelves of secondary schools in Pennsylvania. A list of guidelines is given to eliminate problems in the future.

659. McKusick, Blaine C. Prudent practices for handling hazardous chemicals in laboratories. Science, v211 n4484 p777-80, Feb. 1981.

A National Research Council report has recommended practices for safe handling and disposal of hazardous chemicals in laboratories. They are a practical alternative to detailed regulations on individual chemicals. Topics discussed include physical hazards, chemical hazards, chronic hazards, laboratory ventilation, protective equipment, procedurement, storage, and disposal of chemicals.

*660. McMahon, Lawrence. Chemical clean-up under way. Saskatchewan Bulletin, v53 n4 p1-2, Oct. 22, 1986.

An inter-departmental committee has been set up by the Saskatchewan government to assist schools and hospitals in disposing of dangerous chemicals and to help correct the dangerous chemical storage situation that exists in some of the high schools. An information booklet has been sent to schools listing chemicals, their properties and appropriate disposal methods.

661. Mento, Mary Ann. Chemical disposal for a high school chemistry laboratory. Science Teacher, v40 n1 p30-32, Jan. 1973.

A method of disposal is suggested that is superior to the dilution method. The procedures are based on the conversion of the wastes to less toxic or harmless forms or neutralization, so that they won't be a shock to the sewage system, and then excess dilution.

662. Michelotti, F.W. Hazardous chemical safety in the laboratory. Analytical Chemistry, v51 n4 p441A-54A, April 1979.

A review of the fundamentals of hazardous chemical safety with specific emphasis on flammable liquids, corrosive chemicals, insidious hazards, compressed gases, and cryogenic liquids.

663. Mikell, W.G., and L.R. Hobbs. Laboratory hood studies. Journal of Chemical Education, v58 n5 pA165-69, May 1981.

Characterizes a number of the bench-type chemical laboratory hoods. Reports results of a study that determined the levels of protection each type provides, exploring variables such as laboratory air supply systems, face velocity, work practices, personnel movement, and the effect of equipment location in the hood.

664. Mikell, William G., and William G. Drinkard. Good practices for hood use. Journal of Chemical Education, v61 n1 pA13-A14, Jan. 1984.

Describes safety practices for laboratory fume hoods based on certain assumptions of hood design and performance. Also discusses the procedures in preparing to work at a hood. A checklist of good hood practices is included.

665. Muir, G.D. Communication in safety. Education in Chemistry, v12 n6 p172-173, Nov. 1975.

Discusses means of disseminating information about hazardous laboratory materials and situations; includes student-student contact, student-teacher contact, textbooks, research papers, and government services.

666. Nagel, Miriam C. How much is too much? Toxic chemicals in high school labs. Journal of Chemical Education, v59 n12 p1040-41, Dec. 1982.

Lists 37 chemicals classified as suspected carcinogens and suspected teratogens (chemicals capable of producing malformations in an embryo). Offers suggestions to high school chemistry teachers for conducting safe laboratory investigations by avoiding use of these potentially toxic materials.

667. Nagel, Miriam C. How safe is that experiment? Journal of Chemical Education, v59 n10 p868-69, Oct. 1982.

Discusses several accidents which occurred during secondary school science/chemistry laboratory experiments, offering suggestions for conducting safe experiments. Indicates that all experiments should be planned using the safest chemicals and safest reactions illustrating a concept, and that audiovisual aids should be used if no safe experiment is possible.

668. Nagel, Miriam C. An innovative course in lab safety. Journal of Chemical Education, v59 n9 p791, Sept. 1982.

Describes a course designed to provide secondary school science teachers with the background necessary to implement an effective safety program for their science labs. Lectures, demonstrations, group discussions, slides, films, videotapes, and guest speakers were utilized in the summer course. Evaluations indicated course objectives had been met.

669. Nagel, Miriam C. Lab magic and liability: learning to 'drive safely' in chemistry. Science Teacher, v49 n6 p31-33, Sept. 1982.

Provides tips for stimulating interest in high school chemistry while imprinting safe laboratory practice. Suggests safe alternatives to potentially dangerous "magic show" and other chemical reactions. Also suggests that safety education be a prerequisite for certification of secondary school chemistry teachers.

670. Nagel, Miriam C., Ed. Safety tips. Journal of Chemical Education, v61 n9 p837-39, Sept. 1984.

Outlines a cooperative effort in Iowa to eliminate dangerous or unwanted chemicals from school science storerooms. Also reviews the Council of State Science Supervisor's safety program and discusses how to prevent cuts and punctures from jagged glass tubing.

671. Nagel, Miriam C., Ed. Safety tips. Journal of Chemical Education, v61 n11 p1012-13, Nov. 1984.

Four questions chemistry teachers should regularly ask are: How well informed am I on safety? Do I instruct students about safety in an appropriate manner? How well do I plan for safety? Do I accept my responsibility to supervise personally all laboratory activities?

672. Nagel, Miriam C. Safety tips: peroxides can be treacherous. Journal of Chemical Education, v61 n3 p250-51, March 1984.

Peroxides are unstable, shock-, thermal-, and friction-sensitive compounds whose sensitivity increases with concentration. In addition, peroxides can form in aging organic solvents and stored alkali metals. Cautions related to storage, use, and disposal of peroxides in the secondary school chemistry laboratory are discussed.

673. National Academy of Sciences - National Research Council. Prudent Practices for Handling Hazardous Chemicals in Laboratories. Washington, D.C.: National Academy of Sciences - National Research Council, Assembly of Mathematical and Physical Sciences. 1981. 291p. ED 221 362. Not available ERIC.

This guide recommends procedures for safe handling and disposal of hazardous substances, along with broad recommendations for developing comprehensive laboratory safety programs. Although specific information is provided, general principles which can be adapted to activities in any laboratory are emphasized. Section 1 focuses on procedures for working with chemicals in the laboratory including: (1) general recommendations for safe practices in laboratories; (2) procedures for working with substances posing hazards because of acute toxicity, chronic toxicity, or corrosiveness, for working with substances posing hazards because of flammability/explosibility, and for working with compressed gases; (3) known hazards of and specific precautions for selected chemicals; (4) protective apparel, safety equipment, emergency procedures, and first aid; (5) design requirements for and use of electrically powered laboratory apparatus; and (6) laboratory ventilation. Section 2 provides procedures for: (1) ordering/procurement of chemicals; (2) storing chemicals in storerooms/stockrooms; (3) distributing chemicals from stockrooms to laboratories; (4) storing chemicals in laboratories; (5) chemical disposal in laboratories; (6) special disposal problems in life science laboratories; and (7) disposal of waste materials from the institution. Evaluation of published epidemiological studies of chemists, recommendations for future studies, and threshold limit values for chemicals/physical agents in workroom air are provided in appendices.

674. National Council on Radiation Protection and Measurements. Radiation Protection in Educational Institutions. NCRP Report No. 32. Washington, D.C.: National Council on Radiation Protection and Measurements. May 1, 1973. 56p. NIOSH-00049089.

This report provides information on the hazards involved in the use of radiation-producing equipment or radioactive material in science demonstrations and experiments, and recommendations on the means of protection. Following biological considerations, there are three chapters on radiation sources used in schools, basic principles of radiation protection, and the radiation protection program. Appendices contain definitions of radiation units and terms as well as findings of a survey and a radiation safety check sheet.

**675. National Inst. for Occupational Safety and Health. Safety in the School Science Laboratory: Instructor's Resource Guide. Rockville, Md.: National Inst. for Occupational Safety and Health (DHEW/PHS), Aug 1977. 483p. Available ERIC. ED 157 701.

This publication presents a suggested inservice training program for safety in the laboratory for secondary school science teachers. It consists of three parts. Part one discusses administrative guidelines. Part two consists of 14 lesson plans for lectures in the training course for teachers. Each of these lesson plans consists of an overview, table of contents, and text in a script format. Most of these also have reference citations and a slide script. Each lecture lesson plan is complete and independent of the others to facilitate changes in the desired sequence. Part three has four workshop lesson plans for the course. Each workshop consists of a lesson plan with overview, listing of contents, text in script format, exhibits for background or reference, and worksheets for exercises. Directions are also provided. Each workshop is tied to a lecture lesson. Five appendices are presented at the end of the publication: (1) Audio-Visuals; (2) Library Resources; (3) Dictionary of Resources; (4) Program Evaluation; and (5) Trainee Evaluation.

676. Newman, Melvin S. An improved mercury retriever. Journal of Chemical Education, v55 n2 pA78, Feb. 1978.

Describes a simple device to improve the set retrieval of spilled mercury.

677. Nicholls, Gerald P., and Ronald F. Gleeson. Potential radiation hazards from surplus military equipment. Science Teacher, v48 n8 p33-35, Nov. 1981.

Describes potential radiation hazards from surplus or donated military equipment. Examines hazards by providing descriptions of situations in which radiation hazards have been found.

**678. North Carolina State Dept. of Public Instruction. Safety First in Science Teaching. Raleigh: North Carolina State Dept. of Public Instruction, Div. of Science Education. April 1977. 58p. Available ERIC. ED 146 049.

This publication is intended to be a resource for teachers and administrators who are responsible for the safety of students, and others, in the general areas where science instruction is occurring. The handbook is designed to assist teachers of science regardless of their background in science. Particular concerns such as laboratory safety procedures, chemical disposal, poisonous plants, and the use of radioactive sources in the classroom are among topics discussed. A bibliography lists additional reference material on science safety available in journals and from state and federal education agencies.

679. Orton, R.J.J. Safety VI: hazards in physics laboratories. School Science Review, v66 n236 p447-54, March 1985.

Summarizes advice from the Laboratory Safeguards Subcommittee of the Association for Science Education related to flames and heat, hazardous chemicals, electricity and dangerous voltages, and mechanical hazards. Knowledge is cited as the key to preventing accidents in physics laboratories.

680. OSHA warns of possible cancer hazards in school laboratories. Job Safety and Health Report, v6 n5 p39, Feb. 23, 1976.

681. Ozaruk, N. Lab safety: the case of the errant cylinder. Journal of Chemical Education, v53 n6 p373, June 1976.

Discusses what can occur in a laboratory if a cylinder valve is separated from a compressed gas cylinder.

682. Patnoe, Richard L. Chemistry laboratory safety check. Science Teacher, v43 n7 p28-29, Oct. 1976.

An accident prevention/safety check list for chemistry laboratories is printed. Included are checks of equipment, facilities, storage and handling of chemicals, laboratory procedures, instruction procedures, and items to be excluded from chemical laboratories.

683. Picric acid [in school laboratories]. CAFC Dialogue n30 p1, Sept. 1980.

684. Picric acid provokes alarm in schools. Chemical and Engineering News, v57 n9 p7-8, Feb. 26, 1979.

685. Pierce, J.T., and others. Safety in the chemical laboratory: experiments integrating evaluation of chemical hazards into the

chemistry curriculum. Journal of Chemical Education, v61 n3 p83,85, March 1984.

Proposes use of two experiments to sample and analyze contaminents in the laboratory. Experiments focus on estimating hydrogen sulfide levels in the general chemistry laboratory during qualitative analysis and determining the concentration of organic vapors associated with organic chemistry laboratories.

686. Pine, Stanley H. Safety in the chemical laboratory -- chemical management: a method for waste reduction. Journal of Chemical Education, v61 n2 pA45-A46, Feb. 1984.

Discusses methods for reducing or eliminating waste disposal problems in the chemistry laboratory, considering both economic and environmental aspects of the problems. Proposes inventory control, shared use, solvent recycling, zero effluent, and various means of disposing of chemicals.

687. Pipitone, David A. Safe storage of chemicals: a checklist for teachers. Science Teacher, v48 n2 p16-21, Feb. 1981.

Presents a checklist developed to help chemistry teachers assess conditions in the storeroom. The checklist format facilitates a systematic assessment of storage conditions and serves as a record of where improvements are needed. Also lists classes of chemicals requiring special storage precautions.

688. Pipitone, David A., and Donald D. Hedberg. Safe chemical storage: a pound of prevention is worth a ton of trouble. Journal of Chemical Education, v59 n4 pA159-65, May 1982.

Results from two surveys of chemists and educators conducted at two conventions indicate weak spots in facilities, poor storage information, and failure to take precautions against reactive hazards. Includes suggestions and a checklist related to a wide range of storage problems.

689. Pitt, Martin J. Safety in the chemical laboratory: please do not touch: some thoughts on temporary labels in the laboratory. Journal of Chemical Education, v61 n9 pA231-32, Sept. 1984.

Discusses six common problems which may occur when using temporary labels on chemicals, samples, or mixtures in teaching or research laboratories. Solutions to each of these problems are offered.

690. Québec. Ministère de l'Education. Santé et sécurité dans l'enseignement des sciences de la nature: secondaire. Québec, Que.: Ministère de l'Education, 1985. 89p.

Ce guide de sensibilisation et d'éducation comprend une définition de la problématique ainsi que des orientations en matière de santé et de sécurité dans l'enseignement des sciences. Il contient des propositions aux commissions scolaires, à la direction d'école, au personnel enseignant, aux techniciens en travaux pratiques et appariteurs ainsi qu'aux élèves. Il présente des mesures spécifiques de sécurité en ce qui concerne les animaux, les plantes, les produits chimiques, le verre, l'électricité, le chauffage et les brûleurs, le prélevement et le laser. Il comporte aussi des références bibliographiques ainsi que des annexes (listes de contrôle, rapport d'accidents, listes de substances, de produits corrosifs et inflammables, de symboles, etc.).

691. Reese, Kenneth M. Health and Safety Guidelines for Chemistry Teachers. Washington: Department of Educational Activities, American Chemical Society, 1979. 15p.

692. Renfrew, Malcolm M., ed. Safety in the chemical laboratory. Journal of Chemical Education, v55 n4 p193-8, April 1978.

Presents the concluding article on a checklist for chemistry laboratory safety.

693. Renfrew, Malcolm M., ed., and Richard E. Bayer. Safety in the chemical laboratory: evaluation of chemical atmospheres in science laboratories. Journal of Chemical Education, v57 n10 pA287-A88, Oct. 1980.

Recommends that science teachers make evaluations of chemical atmospheres in science laboratories so that serious health problems can be avoided. Uses data from methylene chloride to provide guidelines for understanding the effects of chemicals on the human body.

694. Renfrew, Malcolm M., ed., and Robert B. Scott, Jr. Safety in the chemical laboratory: control of hazards in laboratories. Journal of Chemical Education, v55 n3 pA129-44, March 1978.

Reviews eleven categories for controlling hazards in laboratories.

695. Renfrew, Malcolm M., ed., and Carl J. Tenpas. Safety in the chemical laboratory. Laboratory chemical reports: the first step in chemical safety. Journal of Chemical Education, v57 n12 pA337-39, Dec. 1980.

> Describes a prelab activity, the chemistry report, that acquaints college students with the nature of the chemical(s) they are using in the laboratory. Methodology, experimental procedures and safety rules are emphasized, with particular emphasis on potential hazards, safety requirements and emergency procedures.

696. Restricted chemicals. Chem 13 News, n117 p3-9, Nov. 1980.

> Listed are chemicals commonly used in the science classroom, including restrictions for classroom use. Based on recommendations of the Association for Science Education. Seven categories of restrictions are imposed, and each chemical listed has one or more restrictions. When appropriate, an alternative chemical is suggested.

697. Rieber, Elaine R. The Question of Safety in Secondary School Science Laboratories. Ottawa: Canadian Council on Children and Youth, May 1984.

> This paper was prepared in response to a 1983 letter from a secondary school teacher in Quebec concerning the issue of mercury vapour in science labs and its potential harmful effect on the health of children. It was concluded that there are no provincial regulations with respect to safety standards for secondary school science labs, and no systematic monitoring of safety conditions exists at any level.

698. Rossing, Thomas D., and Betty Windham. Noise emission from laboratory air blowers. American Journal of Physics, v46 n5 p503-6, May 1978.

> Product noise ratings for a number of laboratory air blowers are reported and several recommendations for reducing laboratory noise from air blowers are given. Relevant noise ratings and methods for measuring noise emission of appliances are discussed.

699. Rothchild, Robert. Safety in the laboratory: 1,1,1-Trichloroethane. Journal of Chemical Education, v60 n9 pA228-29, Sept. 1983.

> Discusses use of 1,1,1-trichloroethane as a substitute for

carbon tetrachloride. Provides information on additives to commercially supplied sources in relation to possible reaction interferences. Warns of toxicity and possible carcinogenic action.

**700. Sabbath, Larry, and others. Oakland County Science Safety Series: Reference Guide for Physics and Physical Science. Pontiac, Mich.: Oakland County Schools, 1977. 106p. Available ERIC. ED 174 475. Microfiche only.

This reference guide is designed to organize and suggest acceptable practices and procedures for dealing with safety in the area of science instruction. It is intended as a reference for teachers, administrators and other school staff to assist them in planning science activities and in making safety decisions in a situational context. This guide deals specifically with issues pertinent to the teaching of physics and physical sciences.

701. Safety checklist [for science teachers]. B.C. Science Teacher, v19 n3 p41-43, Mar. 1978.

702. Safety check lists. Education in Science, n75 p18-19, Nov. 1977.

Safety checklists (week, term, annual) for secondary school science departments are provided.

703. Safety in school science. Education in Science, n85 p26-28, Nov. 1979.

The use of pesticides in the schools is discussed. Some potential hazards include seeds dressed with fungicide/insecticide mixtures, fumigation of animal houses and greenhouses, and storage and disposal of pesticides.

704. Safety in school science. Education in Science, n87 p16-26, April 1980.

Presents two articles which are part of a series concerned with safety in school science in the United Kingdom. The two articles deal with restricted chemicals and experiments.

705. Safety in school science. Education in Science, n89 p16-22, Sept. 1980.

Methods for organizing and storing chemicals in teaching laboratories and preparation rooms are given, emphasizing storing and handling of flammable liquids. Two appendices are given: (1) flash points and autoignition temperatures of common flammable liquids; (2) content of a kit, with instructions, for cleaning up spills of flammable liquids.

706. Safety in school science: possible carcinogenic hazards in school science. Education in Science, n84 p17-21, Sept. 1979.

This is the fourth in a series of articles concerned with safety in school science. This article presents some facts about eight types of carcinogenic chemicals and suggests precautions in their use in British schools. A safety bibliography is also included.

707. Safety in science laboratories (2nd edition). Education in Science, n69 p20-21, Sept. 1976.

Reviews the English booklet, "Safety in Science Laboratories." Included in the booklet is a discussion of teacher roles in ensuring safety in chemistry and biology laboratories.

708. Sandercock, E.R. Asbestos substitutes. South Australian Science Teachers Journal, n771 p89, April 1977.

Describes four substitutes for asbestos that may be used in science laboratories.

709. Sanders, Howard J. Chemical lab safety and the impact of OSHA. Chemical and Engineering News, v54 n22 p15-27, May 1976.

Discusses new safety standards imposed by the Occupational Safety and Health Administration (OSHA) in the areas of both school and industrial chemistry laboratories.

710. Saunders, G. Thomas. Updating older fume hoods. Journal of Chemical Education, v62 n6 pA178-80, June 1985.

Provides information on updating older fume hoods. Areas addressed include: (1) adjustment of the hood's back baffle; (2) hood air leakage; (3) light level; (4) hood location in relation to room traffic and room air; and (5) establishing and maintaining hood performance.

711. Scheide, Eugene P. The Piezoelectric-crystal mercury dosimeter. Physics Teacher, v15 n1 p47-51, Jan. 1977.

Describes the construction and application of a device small enough to be worn on a worker's clothing that can monitor exposure to mercury.

712. School lab safety aim of Delaware program. Chemical and Engineering News, v56 n41 p15, Oct. 1978.

Stresses the importance of safety in school laboratories. Describes a state program to inspect chemistry laboratories in order to correct unsafe conditions in them. Advocates safety courses for teachers in their training.

**713. School Science Laboratories. A Guide to Some Hazardous Substances. A Supplement to the National Institute for Occupational Safety and Health Manual of Safety and Health Hazards in the School Science Laboratory. Washington, DC.: Council of State Science Supervisors, 1984. 52p. Available ERIC. ED 247 101.

The purpose of this document is to identify potentially hazardous substances that may be in use in many school laboratories and to provide an inventory of these substances so that science teachers may take the initiative in providing for the proper storage, handling, use, and if warranted, removal of hazardous materials. The document consists of 11 sections: (1) a discussion of a total science safety program; (2) limitations of the guide; (3) instructions for use of health and safety tables; (4) health and safety tables on explosives, toxic substances, substances identified as corrosive/irritating, and substances identified as known or probable human and animal carcinogens; (5) a list of safety recommendations; (6) information on chemical and biological storage rooms and suggested chemical storage patterns; (7) a list of chemicals (in tabular format), which indicates the storage and use hazards for each chemical; (8) recommendations for textbook publishers and science supply companies; (9) a list of organizations to help science teachers deal with chemicals in the school laboratory; (10) a bibliography; and (11) a form used to evaluate the document.

*714. Schools get rid of dangerous chemicals. ATA News, v15 n2 p4, Sept. 22, 1980.

A newspaper story regarding the presence of picric acid, a highly explosive chemical when crystallized, in some school labs, prompted a major cleanup of hazardous chemicals from Alberta school labs. Over two tonnes of potentially letha chemicals were picked up and destroyed. A long term safety program for dealing with chemicals in schools is outlined.

715. Schools remove hazardous chemicals from labs. Chemical and Engineering News, v60 n39 p27, Sept. 27, 1982.

Describes safety committee (New York section, American Chemical Society) survey of college chemistry facilities to assess hazards and make recommendations, and a cooperative project in Iowa to identify and remove hazardous chemicals from college/secondary school classrooms. Includes a partial list of hazardous chemicals identified by the Iowa project.

716. Scottish Schools Science Equipment Research Centre. Hazardous Chemicals: A Manual for Schools and Colleges. Edinburgh: Scottish Schools Science Equipment Research Centre, 1979. 240p. ED 206 510. Not available ERIC.

Compiled as an immediate source of reference and guidance, this manual was published by the Scottish Schools Science Equipment Research Centre to provide the following information about alphabetically listed chemicals considered to be hazardous: (1) the hazards; (2) incompatibility with other agents; (3) methods for handling, storage, disposal and spillage; and (4) first aid techniques for eyes, lungs, mouth, and skin. An introduction describes general safety rules for the use of chemicals in school laboratories.

717. Shurpik, Anton J., and Howard J. Beim. A chemist's view of labeling hazardous materials as required by the U.S. Department of Transportation. Journal of Chemical Education, v59 n2 pA45-A52, Feb. 1982.

Discusses characteristics of materials and labels used by the Department of Transportation, including label design and color: red (flammable and spontaneously combustible), white/yellow (radioactives), orange (explosives), white (poisons), yellow (oxidizers), green (non-flammable gas), black/white (corrosive), blue (dangerous when wet). Includes optional labels and 10 guidelines for label use.

*718. Sibley, Christine. A case of negligence. Crucible, v9 n6 p14-18, Sept. 1978.

After an accident in a high school science lab, the teacher was found guilty of negligence for failure to instruct properly, caution and supervise and failure to order the student to wear safety goggles. The necessity for science teachers to be continuously vigilant with regard to safety procedures is emphasized. Teachers are cautioned against accepting a teaching position in chemistry if that is not their major field. Alberta Teachers' Association Standards of Professional Conduct require that "a teacher protests both the assignment of duties for which he is not qualified and conditions which make it difficult to render professional service". In the event that a case of negligence is brought against him, the school board must then assume responsibility.

*719. Sibley, Christine E. Negligence in the science laboratory. Alberta Science Education Journal, v17 n1 p70-74, Sept. 1978.

Though no teacher is free from the possibility of facing a change of negligence, the chemistry teacher must realize that the environment within which he instructs contains more potential for accidents than the ordinary classroom setting. Chemistry teachers must be well acquainted with the potential hazards found within the laboratory. Safety must be stressed at all times. Teachers whose major field is not chemistry are cautioned against accepting a teaching position for which they may not be fully qualified. Various court cases resulting from laboratory accidents are cited.

720. Sichak, Stephen, Jr. OSHA and experimental safety design. Journal of Chemical Education, v60 n1 pA9-A10,A12-A13. Jan. 1983.

Suggests that a governmental agency, most likely Occupational Safety and Health Administration (OSHA) be considered in the safety design stage of any experiment. Focusing on OSHA's role, discusses such topics as occupational health hazards of toxic chemicals in laboratories, occupational exposure to benzene, and role/regulations of other agencies.

721. Sievers, Dennis. Unnecessary risks. Science Teacher, v51 n6 p29-33, Sept. 1984.

Provides safety considerations related to chemistry experiments and demonstrations. Includes procedures for a volcano demonstration (which does not use ammonium dichromate) and three clock reactions, a list of hazardous chemicals, and a list of questions to help decide whether the risk of an experiment is acceptable for a class.

722. Smith, Roger M., and Malcolm M. Renfrew. Safety in the chemical laboratory: benzene, a familiar hazard? Journal of Chemical Education, v57 n3 pA85-A86, March 1980.

Reviews the dangers of benzene as a toxin as well as a flammable substance.

**723. Steere, N.V. Safety in the chemical laboratory XIIa. Eye protection in laboratories. Journal of Chemical Education, v41 n12 pA936+, December 1964. NIOSH-00006284.

A review of the types of eye protection needed in a laboratory, the protective equipment available, standards and legal requirements for eye protection, and case histories of eye injuries and resultant suits. The American Standard Safety Code for Head, Eye, and Respiratory Protection details standards for impact resistance, penetration resistance, and flame resistance of eye protection devices, and also sets standards for optical quality of lenses and provides information on transmittances of various shades of filter lenses. Laboratory hazards include lasers, glassblowing, welding, wet or dry chemicals, and explosions. Lenses may be toughened by controlled surface cooling or by a chemical treatment. Certain procedures would require the use of glasses with side shields, goggles, or face as well as eye protection. The laws of Ohio, Massachusetts, and Maryland concerning eye protection in schools are briefly described. Various examples of eye and other injuries are given; when suits are brought against Boards of Education, the teachers involved are usually named as co-defendants.

724. Steere, Norman V. Safety in the Chemical Laboratory. Easton, Pa.: American Chemical Society, Division of Chemical Education, 1967, 1p. ED 012 245. Not available ERIC.

Monthly articles on laboratory safety that appeared in the "Journal of Chemical Education" between January 1964 and January 1967, are combined in this manual for high school and college chemistry teachers. A general section deals with (1) responsbility for accident prevention, (2) safety considerations in research proposals, (3) a safety symposium for high school students, (4) a study of the attitudes of workers toward accident prevention, (5) a university program in laboratory management and safety, (6) the literature on chemical safety, and (7) sources of information on hazards. Topical sections include (1) toxicity and exposure limits, (2) laboratory ventilation, (3) flammable liquids, container labelling, and storage of records and chemicals, (4) eye protection and body shielding, (5) peroxides and dangerous chemicals, (6) compressed gases and cryogenic fluids, (7) unattended laboratory operations, and (8) drinking water and microbiological contamination and laser hazards. Safety considerations in laboratory design are the subject of the final section. A series of case histories of laboratory accidents and fires is included. The manual is indexed by subject and author.

725. Steere, Norman V. Laboratory Ventilation and Safety. Chicago, Illinois: F.D. Thompson Publishing, Inc., June 1965. 6p. ED 030 281. Not available ERIC.

In order to meet the needs of both safety and economy, laboratory ventilation systems must effectively remove air-borne toxic and flammable materials and at the same time exhaust a minimum volume of air. Laboratory hoods are the most commonly used means of removing gases, dusts, mists, vapors, and fumes from laboratory operations. To be effective, a laboratory hood and its associated components must confine contaminants within the hood, remove them through ductwork, and dispense them so they do not return to the building through the fresh air supply system. Hood performance should be assisted by providing ventilated chemical storage cabinets which will require less air flow and which can be exhausted in a separate system 24 hours a day. Suggestions for the improvement of existing fume hoods as well as the design of new hoods is discussed.

726. Steere, Norman V., Ed. Safety in the chemical laboratory: CXXXIII. A guide to laboratory safety. Journal of Chemical Education, v53 n12 pA493-A504, Dec. 1976.

Presents a manual of safe laboratory practices and precautions, covering such things as fire, explosion, poisoning, and injuries.

727. Steere, Norman V., Ed. Safety in the chemical laboratory. Journal of Chemical Education, v52 n11 pA509-A511, Nov. 1975.

Discusses legislation and programs aimed at preventing occupational cancer. Includes the results of recent research in the identification of occupational carcinogens.

728. Steere, Norman V., Ed. Safety in the chemical laboratory. Journal of Chemical Education, v50 n10 pA497-A499, Oct. 1973.

Suggests laboratory instructors preserve the necessary evidence after an incident in classroom. Included is a checklist for gathering evidence that trial lawyers will need to present defense adequately.

729. Steere, Norman V., Ed. Safety in the chemical laboratory. Journal of Chemical Education, v52 n1 pA23-A25, Jan. 1975.

Accumulation of sodium azide in copper or lead plumbing can result in the formation of copper or lead azide and an eventual explosion. Presents procedures to dispose of azide wastes.

730. Steere, Norman V., Ed. Safety in the chemical laboratory. Journal of Chemical Education, v51 n7 pA366-A369, July 1974.

The occupational safety and health standards adopted for fourteen carcinogens are specified and discussed. Standards on benzidine and beta-propiolactone are reprinted in full as examples.

731. Steffel, Margaret J. Safety in the chemical laboratory: cyclohexane as a cryoscopic solvent. Journal of Chemical Education, v58 n4 pA133-A34, April 1981.

Suggests that cyclohexane be used as a solvent in experiments usually using benzene, which has been placed on the list of chemicals that are confirmed carcinogens. Reasons for selection of cyclohexane and experimental procedures using this solvent are described.

**732. Stening, S.E.L. Methaemoglobinaemia due to aniline. Medical Journal of Australia, v1 p578-579, April 21, 1951. NIOSH-00042042.

A clinical case of methemoglobinemia due to poisoning by aniline is presented. While in his chemistry laboratory a schoolboy sat on a seat upon which aniline had been spilled. Within 45 minutes the boy was in a localized atmosphere of vaporizing aniline (on his trousers), to which he was exposed for the next 3 hours before he collapsed. A contaminated handkerchief was in his pocket, and he probably had some of the aniline on his fingers, which may have been conveyed to his mouth. The summation of the exposures brought him very close to death. Deep cyanosis was treated by the intravenous administration of methylene blue, and the patient recovered rapidly. Precautions to be used in chemistry classes with the recommendation that aniline not be used, and first-aid measures for persons exposed to aniline are outlined.

733. Stevens, Arthur M. Contain flammable liquid hazards in your lab. Research/Development, v28 n12 p42-46, Dec. 1977.

Discusses hazards involved in the storage of flammable liquids, particularly those requiring refrigeration.

734. Stevens, Arthur, and Malcolm M. Renfrew, Ed. Safety in the chemical laboratory: flammable liquids -- why the hazard? Journal of Chemical Education, v56 n3 p119A-24A, March 1979.

Information is given on the basic chemistry of fire and on the characteristics of flammable liquids.

*735. Stronck, David R. Can labs be both investigative and safe? B.C. Science Teacher, v26 n3[i.e.1] p20-24, Spr. 1984.

This article discusses the difficulty of maintaining safety while providing investigative experiences in labs. In response to the recommendations of the 1982 B.C. Science Assessment, a new Science Safety Manual was issued by the B.C. Ministry of Education in 1984. Some of the guidelines included in this manual are as follows: that a science safety officer be appointed in each school; that a lab technician be hired to set up all experiments and to help with supervision of lab classes whenever the number of students exceeds 24; and that each student have at least five square meters in the lab. Teachers are repeatedly reminded that the responsibility for safety lies with them and that their procedures will be scrutinized in the case of any accident. The author calls upon B.C science teachers to urge administrators to give the guidelines set down in the Science Safety Manual the highest priority.

**736. Sulcoski, John W. How to Handle Radioisotopes Safely. Washington, D.C.: National Science Teachers Association, 1971. 12p. Available ERIC. ED 063 110. Microfiche only.

This booklet is one in a series of instructional aids designed for use by elementary and secondary school science teachers. The various units and forms of radioactive materials used by teachers are first considered. Then, the quantities of radioisotopes that a person may possess without a license from the Atomic Energy Commission (AEC) are discussed, including a list of radioisotopes and allowable quantities. Procedure for applying to the AEC for a license to possess greater quantities is reviewed. Safety guidelines for instructors and students are considered, including safety in dispensing radioisotopes in the laboratory, laboratory precautions, decontamination, storage of radioactive materials, and waste disposal.

**737. Survey of high schools for radiation-producing equipment. Public Health Reports, v84 p520, June 1969. NIOSH-00009401.

A survey of high schools for possession and use of radiation-producing electronic equipment has shown that this equipment is sometimes used in unsafe practices for scientific class demonstrations. Equipment discovered in use in some 200 institutions in the United States included X-ray machines, Van de Graaf accelerators, and microwave and laser devices. The survey identified types and quantities of equipment which are being used, estimated potential student exposures, and determined the status of communications between school administrators and radiological health agencies. The survey and study established an informational basis for recommendations for safe practices in the use of radiation-generating equipment in educational institutions.

738. Swami, Piyush, and Karan Singh. Quiet danger in chemistry lab. Science Teacher, v52 n6 p42-45, September 1985.

Indicates that the most dangerous laboratory hazards are the least dramatic ones and that hazardous chemicals are often used in laboratories without proper precautions. Selected sources of information essential for secondary schools and recommendations for safe practices and chemical use statistics from a study of Ohio high schools are given.

739. Swinfen, T.C. Chemical labels -- the ASE system. Education in Chemistry, v12 n6 p178-179, Nov. 1975.

Describes chemical labeling standards published by the Association for Science Education in Great Britain to guide educators in identifying hazardous chemicals.

*740. Tessier, Ron. D'inventaire de produits chimiques. Crucible, v14 n4 p27, 1983.

Lors de la préparation d'un manuel de sécurité en science pour l'usage des Ecoles du Conseil de Sudbury, le comité de sécurité en science a dressé une liste de produits chimiques approuvés afin de mieux contrôler l'usage et l'inventaire des produits chimiques dans ces écoles.

*741. Tessier, Ron. Storage and control systems. *Crucible*, v14 n6 p36, Nov-Dec, 1983.

In the course of developing a safety manual for use in the schools of Sudbury Board of Education, the Science Safety Committee drafted a list of approved chemicals for their control and screening in the schools. The system is described. Copies of the document are available from the board.

742. Thompson, Ben. Safety hints for elementary science. *Science and Children*, v12 n3 p20-21, Nov/Dec. 1974.

743. Tinker, Robert. The safe use of lasers. *Physics Teacher*, v11 n8 p455-461, Nov. 1973.

Analyzes the dangers of lasers in a classroom situation to formulate safety standards which are contrasted with federal regulations. Suggests that every laser user should check with the safety precautions to reduce the probability of accidental burns to extremely low levels.

744. Toxic chemicals use in school labs examined. *Chemical and Engineering News*, v60 n5 p5-6, Feb. 1982.

The Consumer Product Safety Commission will recommend an information network to inform students and teachers of current toxicity evaluations of chemicals and of possible use of less hazardous substitutes. Lists names of 33 suspected carcinogens and 11 suspected teratogens.

**745. Trenk, Barbara Scherr. *Health Hazards in the Science Classroom.* New York, N.Y.: American Lung Association, May 1977. 9p. Available ERIC. ED 238 671.

Designed for high school science teachers, the document warns of potential health threats of performing certain experiments and using certain chemicals or chemical combinations in their courses. Following a rationale for more carefully considering health dangers, the document gives suggestions on what can be done by teachers. Reports such as a survey by the Kentucky Labor Department, in which officials found that 90 percent of the state's four-year colleges and 5 percent of the high schools had one or more cancer-causing chemicals, are cited as sources of increasing concern. Sixteen carcinogens regulated by the Occupational Safety and Health Administration (OSHA) are listed, followed by a chart listing dangerous combinations of common school chemicals. Other cautions on handling chemicals are described and organic chemistry is discouraged at the high school level. Teachers are encouraged to re-evaluate laboratory equipment and chemicals and schools are urged to develop safe procedures for storage, use, disposal, and supervision by qualified personnel.

746. Vancouver Board of School Trustees. Science Lab Safety Regulations -- Teachers, Teacher Aides, Students. Vancouver, B.C.: Board of School Trustees, June 1971. 8p. ED 115 475. Not available ERIC.

This publication summarizes safety regulations and guidelines for the science classroom laboratory. Contained are directions to the science department head; responsibilities for safety; responsibilities of the science teacher; storage safety regulations; safe techniques; instructions for science students; and special instructions for chemistry students.

**747. Virginia State Dept. of Education. Safety and Science Teaching. Richmond: Virginia State Dept. of Education, Div. of Sciences and Elementary Administration, May 1984. 64p. Available ERIC. ED 256 610.

This 10-chapter handbook (designed for science teachers and school administrators) describes known hazards associated with science teaching and provides information to develop a framework for local safety programs specifically designed to avoid or neutralize the effects of such hazards. Major areas addressed in the chapters include: (1) the nature of the problem; (2) uses of chemical, activity, and safety equipment inventories to assess safety needs; (3) physical hazards, health hazards, and hazard alerts; (4) planning for safety (including post-accident procedures and guidelines for modifying curriculum and instructional strategies); (5) chemical hazard control (examining purchasing, recordkeeping, storage, environmental protection, and the use, disposal, and labeling of chemicals; (6) potential hazards, control procedures, and first-aid measures related to laboratory animals, microorganisms, blood letting experiments, and field studies; (7) hazards and control procedures related to fire, radiation, model rocketry, extra-curricular activities, and student errands; (8) eye and face protection; (9) documentation (including inventories, accident reports, safety instruction records, and others); and (10) safety considerations related to the design of science laboratories. Supporting documentation, including a list of chemical hazards (positive carcinogens, suspected carcinogens, highly toxic poisons, and explosives/flammables) is included in appendices.

748. Webb, Michael J., and Geoffrey W. Rayner-Canham. Safety workshop for teachers. Canadian Chemical News, v36 n5 p20-21, May 1984.

749. Wilbraham, A.C. Safety in the chemical laboratory: fire safety and fire control in the chemistry laboratory. Journal of Chemical Education, v56 n10 pA311-15, Oct. 1979.

Discusses fire safety and fire control in the chemistry laboratory. The combustion process, extinguishing equipment, extinguisher maintenance and location, and fire safety and practices are included.

750. Williams, V.M.M. The commoner laboratory accidents -- their prevention and treatment. Journal of Biological Education, v8 n4 p201-206, Aug. 1974.

The three common laboratory accidents -- cuts, burns, and fainting -- are considered from the aspects first aid treatment and prevention.

751. Williamson, J.R. Safety tips: hazardous chemical storage. Journal of Chemical Education, v60 n8 p668-69, Aug. 1983.

Discusses storage of hazardous chemicals and provides a list of eight basic safety rules to use in developing a safe storage system. Suggestions include not storing materials alphabetically, storing nonreactive chemicals together, and not storing oxidizers and fuels together.

**752. Wray, J.D. Safety and the hazards of using living organisms or material of living origin. Journal of Biological Education, v9 n3/4 p140-145, August 1975. NIOSH-00073425.

The hazards of using living material and appropriate safety measures, particularly applicable to the school situation, are described. Hazards to mental and physical health are discussed, the latter being divided into a number of fundamental causes and contingent factors, including: allergies, zoonosis, poisons, physical stress, electrical-hazards, radiation, micro-organisms, insects, and ethical considerations.

753. Wyatt, H.V., and K.A. Wright. How safe are microbiology texts? Journal of Biological Education, v8 n4 p216-218, Aug. 1974.

Eleven practical microbiology books intended or recommended for schools have been evaluated for safety. A number of the texts are unsatisfactory and suggest techniques and, or organisms which are potentially dangerous.

754. Yohe, Brad, and Gary Dunkleberger. Safety tips: the chemical storage dilemma: a workable solution. Journal of Chemical Education, v62 n10 p876-78, Oct. 1985.

Highlights guidelines that should be implemented in administering a plan for the proper storage of chemicals. They include housing chemicals in multiple locations within a building to lessen the accident potential, not grouping them in alphabetical order, and storing them according to six major chemical classes.

**755. Young, J.R. Safety in the chemical laboratory LXXXV. The responsibility for a safe high school chemistry laboratory. Journal of Chemical Education, v48 n5 pA349-A356, May 1971. NIOSH-00010704.

A list of hints and reminders for keeping a safe high school chemistry laboratory are presented here for reduction of possible accidents. There are 45 pointers regarding facilities and equipment, 51 regarding safe practices and supervision, and 75 rules for students. This comprehensive listing of laboratory safety guidelines includes first aid measures for emergency situations, necessary safety features of the laboratory such as showers, and chemical handling procedures for students which suggest, for example, the correct way to sniff or taste a chemical, and handling of acids and bases.

756. Young, Jay A. Safety tips: academic laboratory waste disposal: yes, you can get rid of that stuff legally. Journal of Chemical Education, v60 n6 p490-92 June 1983.

Discusses three methods for removing wastes from educational laboratories. These include paying someone with Environmental Protection Agency (EPA) permits, doing part of the work before an EPA contractor carries out final steps, or reducing magnitude of future disposal problems by changing present laboratory procedures. Includes comments on specific waste disposal problems.

757. Young, Jay A. Risk assessment and hazard elimination for undergraduate laboratory experiments. Journal of Chemical Education, v59 n9 pA265-68, Sept. 1982.

Describes a procedure which identifies an experiment as unreasonably hazardous or indicates precautions to be taken rendering the experiment acceptable for assignment to undergraduate students. The procedure follows in parallel form the procedure used to prepare chemical labels.

758. Young, Jay A. The role of labeling in chemical health and safety: recent developments. Journal of Chemical Education, v60 n5 pA141-A144 May 1983.

The purpose of constructing labels is to communicate those scientific facts related to hazards and to select and describe the reasonable precautions that should be taken to prevent otherwise unforseeable harm. Recent developments in the use of combined numeric and pictorial symbols in chemical label construction are described.

759. Young, Jay A., and Howard H. Fawcett. Education for a safe professional life. Journal of Chemical Education, v59 n11 p954-55, Nov. 1982.

Indicates that academe must emphasize professional responsibility for chemical health and safety and engender a similar concern in students. Suggests this may be accomplished both by informing students and by helping them make reasoned decisions concerning their exposure to these hazards.

760. Young, P. Chemicals in school labs may expose students to a risk of cancer. Monitor, v49 n4 p8-9, May 1976.

761. Zlotnik, Mike. Learning conditions: should we decide? B.C. Science Teacher, v19 n1 p11-12, Oct. 1977.

B.C. Science Teachers' Association proposed position paper on learning conditions -- criteria and standards for the science classroom.

**762. Airconditioning for Schools. A Report. New York, N.Y.: Educational Facilities Labs., Inc., March 1971. 14p. Available ERIC. ED 050 469.

This pamphlet advocates air conditioning to improve educational productivity. The physiological effects of thermal environment are explained and educational experiments cited to substantiate the benefits of air conditioning in promoting learning. The necessity and economy of air conditioning for schools with large open-space learning areas and for those with year-round usage is emphasized. Air conditioning as part of a school's modernization process is also discussed.

763. Bee, Minerva. New school brings health hazards. Union WAGE, p3-4 Jan./Feb., 1981.

Students and teachers at a San Francisco high school complained of burning eyes and noses, sore throats, stomach pains, persistant headaches, fatigue, weaknesses, and difficulty concentrating shortly after the start of school in the Fall of 1980. The symptoms steadily worsened and only occurred during attendance at the school, a modern campus designed to be air tight and energy efficient. A toxicology committee of faculty was formed to investigate the possible health hazards of the building and a team from the Occupational Health Clinic at San Francisco General Hospital administered a health questionnaire to students and staff of this and another control school. It is thought that the closed ventilation system, combined with low levels of airborne chemicals in synthetic materials used in the building's construction, such as formaldehyde found in insulating materials, particle board furnishings, carpets, etc., was thought to be the cause of the health problems.

764. Berglund, B., L. Johansson, and T. Lindvall. A longitudinal study of air contaminants in a newly built preschool. Environment International, v8 p1-6, 1982.

In about 100 newly built preschools in Stockholm, staff and children have reported medical symptoms that are associated with bad air quality, such as dry throat, irritation of eyes and lips, hoarseness, hacking cough and itching. The air quality in one such preschool was investigated in a longitudinal study. Typical air contaminants emanating from building materials were determined, their variation over time (0-18 months) was measured, and the influence of the ventilation system on contaminant concentrations was studied. The study shows that all the organic compounds decline in concentration mainly within the first 6 months of occupancy. A preschool building needs to be gassed off during the first six months after its construction with no recirculation of return air allowed. During at least 1 to 2 additional years, it is desired that the recirculation rate of return air is restricted, perhaps to 50%.

*765. Berlowitz, Manfred. Thermal environment and learning. Audiovisual Instruction, v15 n8 p77, Oct. 1970.

A summary of the thermal environment of educational facilities booklet.

766. Bischof, W., and L. Banhidi. Investigation on dynamic school climate. Indoor Air, v5 p309-313, 1984.

The optimal and permissible limit values of indoor temperatures associated with the mental performance of students have been the subject of tests for several years all over the world. This problem is of great importance economically. It is necessary to know the temperature limit values of the room and the influence of these values on the mental performance of the students. The results of a simulation test, made at the Hungarian Institute for Building Science, are elaborated in this paper.

767. Blume, Kathleen A. Air pollution in the schools. In Dickey, Lawrence. Clinical Ecology. Springfield, IL: Charles C. Thomas Publishers, 1976. p369-376.

There are many sources of indoor air pollution in schools. Many children are reacting to a toxic exposure when they become irritable, excited, depressed, unreasonable or antisocial. Many children who demonstrate an inability to learn, who are slow learners, who have reduced reading comprehension and speed, reduced memory, or who show mental confusion, could be satisfactory students if there were no toxic fumes present in their school environment. The major causes of air contamination in schools are found to be aerosol sprays, janitorial supplies, scholastic supplies, building materials and furnishings, heating, ventilating and cooking equipment, cosmetics and toiletries, smoking and school buses.

*768. Bruce M. Small and Associates Ltd. Recommendations for Action on Pollution and Education in Toronto: A Report. Toronto: Board of Education, 1985. v.p.

The Board of Education for the City of Toronto commissioned this report on the potential effects of a polluted environment on learning and on school-safe materials. One of the primary conclusions of the report is that many of the materials within schools are not safe for everyone. Some compounds that have caused reactions include paints, cleaners, new carpets, chalk and laboratory chemicals. The report suggests that it may be necessary to establish a small number of "low-pollution" classrooms in each school which could provide a temporary refuge for the most sensitive students and staff. The report also stresses the importance of educating teachers and parents to recognize the symptoms of environmental sensitivity. Further recommendations include discouraging all smoking in schools and establishing a trouble-shooting group of technical staff to solve pollution problems. The report also contains a detailed subject index and extensive bibliography.

769. Burke, Stanley, and Bob R. Stewart. The effects of temperature and protective clothing upon task completion time, work quality, and student attitude toward learning. Journal of the American Association of Teacher Educators in Agriculture, v21 n3 p5-13, Nov. 1980.

A study of the effects of temperature and protective clothing upon task completion time, work quality, and student attitude toward learning revealed that students can be exposed to temperatures as low as 50 degrees Fahrenheit for up to forty minutes without adversely affecting their work quality.

770. Carey, John. Beware "sick-building" syndrome. Newsweek, p58-60, Jan. 1985.

Study after study has discovered that air inside homes, schools and office buildings can be laden with a variety of chemicals, gases, smoke bacteria and other pollutants -- sometimes in concentrations high enough to pose serious threats to health. Students in a California high school suffered from headaches, sore throats and fatigue from formaldehyde at 1.45 ppm coming from new particleboard shelves in the school library. Carbon monoxide gas and passive tobacco smoke are two of the most serious and common indoor pollutants.

771. Caruba, Alan. Indoor pollution: the invisible enemy. American School and University, v56 n8 p46-47, April 1984.

The problems associated with poor indoor air quality in school and university facilities are more serious than is generally recognized. Common pollutants in educational and office facilities are listed, and possible adverse effects are cited.

*772. Le Collége Royal des Médecins et Chirurgins du Canada. Un énoncé de politique concernant l'usage de la cigarette. Ottawa: CRMCC, 1986. 4p.

Les organisations de la profession enseignante et les associations foyer-école et parents-maîtres sont invitées à participer à la campagne en faveur d'un milieu sans fumée qui a pour but: d'encourager la mise en oeuvre de programmes éducationnels précis qui se sont avérés efficaces, d'après de récentes expériences menées au Canada, pour réduire le nombre d'enfants qui commencent à fumer, et d'offrir dans toutes les écoles des secteurs où il est permis de fumer afin de protéger les non-fumeurs de la fumée ambiante. L'énoncé contient un résumé des preuves indiquant une corrélation entre l'usage du tabac et la santé ainsi que d'autre recommandations.

**773. Education, Children and Comfort. Iowa City: Iowa University, 1965. 8p. Available ERIC. ED 020 644.

Two similar classrooms were set up in the Lennox Living Laboratory, Des Moines, Iowa, one for experimental groups and one for control groups. Temperature, air circulation and humidity can be controlled and measured in both rooms. The rooms are of similar size, layout and construction, the thermal environment being the only variable. The following questions were studied in the experimental schoolhouse -- (1) Is there a difference between boys' and girls' reported comfort? (2) Is there a difference between boys' and girls' reported feelings of comfort in the same environment? (3) What is the effect of temperature and humidity on reported student comfort? (4) What is the actual operating time of the heating, cooling, and ventilating equipment when maintaining the ideal thermal environment? Results are given to these four questions.

**774. Frederick, L., and J. Love. Health Hazard Evaluation Report No. HETA-81-184-946, Our Lady of Visitation Elementary School, Cincinnati, Ohio. Cincinnati, Ohio: Hazard Evaluations and

Technical Assistance Branch, National Institute for Occupational Safety and Health, August 1981. 13p. NIOSH-00119705.

Environmental air samples were analyzed for fibrous glass, general organics, metals, asbestos, and polychlorinated-biphenyls (PCBs). Medical interviews and examinations were also conducted. The principal of the school requested the evaluation in response to an outbreak of skin rash, watery eyes, and breathing problems among students and teachers. Air sampling revealed no detectable concentrations of asbestos, PCBs, or fibrous glass. Samples analyzed for organics showed only carbon-tetrachloride at concentration of 0.04 to 0.95 milligram per cubic meter (mg/cum), below the OSHA standard of 65mg/cu m. Metal concentations in dust samples were considered normal for settled dust. Skin symptoms reported were generally described as a burning or itching. There was no consistent association between time of day, activity, or weather and there was no obvious clustering of symptomatic students within the classrooms. The authors conclude that the cause of the adverse health reactions could not identified and that the symptoms and physical findings present were not typical of any known environmental exposure.

775. Godish, Thad. Formaldehyde and building-related illness. Journal of Environmental Health, v44 n3 p116-121, Nov/Dec. 1981.

The apparent association between building-related illness and formaldehyde contamination of indoor environments is reviewed. In addition to results of field investigations, emphasis is placed on formaldehyde's toxicity, its possible carcinogenicity and apparent association with asthma. Specific problems associated with mobile homes, wood-frame housing, new school buildings and offices are also discussed.

776. Godish, Thad. Indoor air pollution - offices and other public access buildings. Natural Resources Notes, n8, Fall 1984.

Within the last decade there have been hundreds of reported outbreaks of illness among occupants of new or recently remodelled offices, schools, and other public access buildings. These outbreaks have characteristically affected a large number of individuals, in some cases 30-40% of the building's population. Illness symptoms are usually of a non-specific nature often including headaches, dizziness, unusual fatigue, eye, nose and throat irritation, chest tightness and shortness of breath. The building materials and lack of ventilation are often the cause, but furnishings, office equipment, maintenance materials, accidental spills of chemicals, cross contamination from outside, tobacco smoke and microbial contaminants can also be at fault. Investigation procedures and mitigation measures are discussed.

777. Green, George H. Ah-Choo!! Humidity can help. American School and University, v52 n1 p64-65, Sept. 1979.

Proper humidification can help reduce absenteeism and the spread of upper respiratory infection.

**778. Harmon, Darell Boyd. Controlling the Thermal Environment of the Co-ordinated Classroom. Minneapolis, Minn.: Honeywell Corp. 1953. 49p. Available ERIC. ED 033 531. Microfiche only.

The classroom environment is a working surround in which children, through participating in organized experiences, can grow and develop in an optimum manner. Classroom design requires organization of principles of environmental control in order to assure efficient and successful performance. This control cannot be left to chance. In considering the nature of the human organism, how it regulates and maintains its body temperature, as well as those changes which occur under various forms of activity, three factors are relevant to design and control of the thermal environment of classrooms -- (1) The developing child differs from the adult and needs a different set of standards for controlling his thermal environment in the school; (2) Thermally induced stresses can alter the growth, development, and learning of children; and (3) The child's problem-solving capacity is affected by the effective temperature of his classroom. If we are to meet the needs of our growing children, then this understanding necessary for proper classroom design must include knowledge of the control of heat, air movement, and humidity along with that of light, sound, structural materials, teaching space, and the other areas that enter into making adequate classrooms in our schools.

779. Harner, David P. Effects of thermal environment on learning skills. CEFP Journal, v12 n2 p4-6, March-April 1974.

An air temperature of 68 to 74 degrees Fahrenheit is ideal for most learning situations, particularly in reading and mathematics.

**780. Hartman, Robert R. Thermal Environment in School Facilities. A Selected and Annotated Bibliography. Madison: Wisconsin Univ., ERIC Clearinghouse on Educational Facilities, 1968. 28p. Available ERIC. ED 024 252.

Contains a selected and annotated listing of source material concerning the thermal environment in school facilities. It is directed toward the school planner, architect, or administrator concerned with developing a more functional classroom environment. Topical coverage includes -- (1) The Thermal Environment and Learning, (2) Physiological Factors in the Thermal Environment, (3) Heating-Ventilating and Air-Conditioning in the Classroom, and (4) Additional Considerations in Planning and Thermal Environment.

*781. Hill, Doug. Air conditioning. OSSTF Forum, v6 n1 p41, Feb. 1980.

The author discovers, after being transferred to an air conditioned school, that headaches are a way of life for staff and students. His investigations into school air conditioning systems revealed that they are often turned off at night or weekends, thereby causing a chronic low level of oxygen in the building, they are so complex that local maintenance crews often do not understand how they work or even if they are working and that they are chronically underdesigned because there seem to be no clear cut standards.

*782. Humidity effects studied. Saskatchewan Bulletin, v41 p9, Sept. 4, 1974.

A study conducted in 6 public schools in Halifax and 12 in Saskatoon showed that the higher the relative humidity, to a maximum of 50 per cent, the lower the rate of absenteeism and the incidence of upper respiratory disease.

783. Humphreys, M.A. Classroom Temperature, Clothing and Thermal Comfort -- A Study of Secondary School Children in Summertime. Building Research Establishment Current Paper 22/74. Watford, England: Building Research Establishment. Reprinted from The Building Services Engineer (JIHVE), v41 p191-202 Dec. 1973-Feb. 1974. 18p. ED 111 115. Not available ERIC.

This article describes a study of summertime classroom temperature and its relationship to the clothing worn by English secondary school children. Data on classroom temperatures and children's clothing were recorded during one summer for a total of 987 lessons. Consideration of the results suggests that for thermal comfort classroom temperatures should rarely exceed 26 degrees Centigrade and that departures from the prevailing mean temperature should not normally exceed 2 degrees Centigrade. For children in shirtsleeves or summer dresses, the optimum temperature was 24.5 degrees Centigrade, and for children wearing jumpers or blazers, it was 21.5 degrees Centigrade.

784. Ibsen, Karsten Kaas, Ole Valbjorn and Aksel Nielsen. The indoor environment and symptoms of disease. Assessment of the conditions in schools in Copenhagen. Ugeskrift For Laeger. n143 p1919-1923, July 1981.

A comparison was made between the incidence of disease and symptoms and the design of schools, with particular attention to the age of the buildings, flooring and ventilation systems. The registration of conditions of health in 14,561 pupils in 88 schools made by the school health services and a questionnaire involving 1226 pupils in 14 schools in Copenhagen were used. Significantly more numerous cases of allergy (asthma and hay-fever) were found in schools with textiles as floor coverings and significantly more numerous cases of skin conditions in the schools which were less than five years old or which had been renovated within the past five years. 31% of the pupils and 40% of the teaching staff stated that they took headache medicine at least once per month. Under one third of these pupils and over half of these teachers took headache medicine at least once weekly. By comparison between data obtained in the indoor environmental investigation and the registrations made by school health services, it was found that pupils stated higher incidences than those registered by the health services people. More than one third of the pupils participating in the indoor environment investigation had complaints which they attributed to the indoor environment. The majority had complaints concerning heat and noise. In schools with textile floor coverings, static electricity was the most widespread inconvenience as 60% complained about this as compared with 5% in the remaining schools.

785. Kershner, John, and others. Air Quality in the Classroom Affects Memory in Four Learning Impaired Children. Toronto: Ontario Institute for Studies in Education, 1985.

The air in a special education classroom was modified alternatively over a three month period so that every two weeks the children were breathing air with a high ambient concentration of negative air ions. Under double-blind conditions, the four learning impaired children in this class were assessed on measures of immediate memory, letter naming, text copying, math, spelling and a parent-teacher questionnaire. When breathing negatively ionized air, in comparison to a placebo-air condition consisting of regular classroom air, all of the children, irrespective of their unique psychoeducational characteristics, demonstrated a moderate improvement in short-term visual and auditory memory. One child showed a large improvement in classroom behaviour.

786. Kershner, John R., and L.L. Morton. Negative air ionization improves memory and attention in learning-disabled and mentally retarded children. Journal of Abnormal Child Psychology, v12 n2 p353-366, 1984.

The effect of increased concentrations of ambient negative air ions on incidental visual memory for words and purposive auditory memory was investigated in 20 normal grade 4 children, 8 learning-disabled children, and 8 mildly mentally retarded children. All of the children breathing negatively ionized air were superior in incidental memory. The action of negative ions on the neurotransmitter, serotonin, may be the mechanism by which negative ions produce such behavioural effects.

787. Kevan, Simon M., and John D. Howes. Climatic conditions in classrooms. Educational Review, v32 n3 p281-92, Nov. 1980.

Presents an overview of research on the ways in which classroom thermal environment, lighting conditions, ion state, and electromagnetic and air pollution affect learning and the performance of students and teachers.

788. Kitchener classroom for allergic students 'the first in Canada'. Globe and Mail, May 7, 1985.

This article describes in detail the plans for a special low-pollution classroom at Kitchener Collegiate Institute in Kitchener, Ontario. The classroom will accommodate about eight students this fall, preventing their exposure to substances that provoke symptoms ranging from severe headaches to exhaustion. The school's principal, Harry McCosh, stated that the classroom will be cleaned with non-offensive cleansers, and scented felt pens will be replaced with non-scented, non-toxic writing materials. Teachers will be encouraged not to wear perfume, scented hair spray, deodorants or other scented cosmetics that could cause negative reactions in extremely sensitive students.

*789. Knapp, Wes. Formaldehyde gas emissions in portable classrooms raising health concerns. BCTF News, v21 n12 p7, Mar. 25, 1982.

Chemical tests were done on portable classrooms in Kamloops, B.C. after unusually high incidences of red eyes, runny noses, headaches, sinus problems, nausea and vomiting were reported. The tests revealed that formaldehyde gas was emitting from adhesives in the ceilings, walls and floor. Similar problems forced closure of a number of portables in other B.C. school districts. BCTF is developing guidelines for teachers to follow when symptoms of high formaldehyde emissions appear.

**790. Lane, W.R. Thermal Environment and Learning. Iowa City: Iowa Univ., Center for Research in School Administration. 10p. Available ERIC. ED 019 816.

Research on thermal environment in schools is summarized and the status of "thermal environment and learning" research completed and/or underway in the Iowa Center for Research in School Administration is reported. Results are -- (1) Children did learn better under model thermal conditions; (2) Teachers must become more aware of thermal conditions; (3) School administrators, boards of educators, and architects must pay careful attention to thermal conditions in school buildings during planning of new construction or remodeling; (4) Large expanses of glass in classrooms are questionable and make it difficult to control thermal environment; and (5) Initial thermal environment studies by the Iowa Centre have brought questions out for further research. Included are tables, plans, photographs, and a bibliography.

**791. Liss, G.M., and S.H. Ahrenholz. Health Hazard Evaluation Report, No. HETA-82-342-1223, William Blount High School, Maryville, Tennessee. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health. November 1982. 23p. NIOSH-00127113.

Exposures to formaldehyde from urea formaldehyde foam insulation were investigated on July 28 to 30, 1982 at William Blount High School in Maryville, Tennessee. The evaluation was requested by the Tennessee Department of Public Health following an outbreak of skin discoloration and other symptoms among the students. Interviews were conducted with three students who had visited a hematologist, and two biopsy samples were obtained. Interviews also were conducted with 31 other individuals. Area air and bulk insulation samples were analyzed for formaldehyde. Long term airborne formaldehyde concentrations ranged from 0.2 to 0.17 parts per million (ppm), and short term concentrations ranged from 0.01ppm to 0.11ppm. NIOSH recommends that exposure be kept to the lowest feasible limit. The insulation samples did not contain volatile organic compounds. No consistent pattern of symptoms or predominant problems were identified among the interviewed individuals. The authors conclude that no formaldehyde exposure hazard exists at the school.

792. Maclennan, John G. The Impact of Indoor Air Pollution on the Behaviour and Learning Ability of School Children. Paper presented at the International Specialty Conference on Indoor Air Quality in Cold Climates: Hazards and Abatement Measures, Ottawa, Ontario, Apr. 29-May 1, 1985.

The author states that increasing numbers of the Canadian population are inheriting the ability to acquire hypersensitivities to different environmental exposures. The commonest indoor contaminants found in schools are particulate inhalants and chemical fumes, odours and smokes. There are also hazards for the food sensitive person, but these can usually be managed by ecological control of lunches and supervision by school personnel. Important chemical exposures are derived from tobacco smoke, perfume, fossil fuels and their derivatives, plant terpenes, photocopiers, duplicators, cleaning and maintenance materials, craft and other office and school supplies. In the majority of cases, the brain and central nervous system are the major areas of hypersensitive reaction which is reflected in the child's behaviours and ability to learn.

793. Metropolitan Toronto School Board. An Annotated Bibliography on Air Conditioning With Particular Reference to Schools. Toronto: Metropolitan Toronto School Board, July 1974. 11p.

A 61-item bibliography divided into sections: surveys, general materials, research, technical material, and renovation.

794. Morton, L.L., and J.R. Kershner. Negative Air Ionization Improves Memory and Attention in Learning Disabled and Mentally Retarded Children. Toronto: Ontario Institute for Studies in Education, 1982. 22p.

The effect of increased concentrations of ambient negative air ions on incidental visual memory for words, and immediate auditory memory for dichotic digits was investigated in 20 normal grade 4 children, 8 learning disabled children, and 8 mildly mentally retarded children. Half of each group was randomly assigned to an unmodified air-placebo condition under double-blind testing procedures. Those breathing negatively ionized air were superior in incidental memory. In dichotic listening, the learning impaired groups under placebo were affected unduly by the "priming" influence of listening selectively to one ear for half of the trials, and then switching to the alternate ear. The negative ions produced a counterpriming effect in the impaired children, tending to off-set the attentional difficulties shown in dichotic performance.

795. Nielsen, Ove. Quality of air and the amount of fresh air in classrooms. Indoor Air, v5 p221-226, 1984.

The results of a study of the indoor climate at 11 Danish schools are described. The investigation shows how the pupils themselves experience the indoor climate and indicates, for example, the relationship between the volume of outdoor air supplied per pupil and the pupils' evaluation of the quality of the air in the classroom.

*796. No smoking policies -- a burning issue. Canadian School Executive, v6 n7 p32-33, Jan. 1987.

This article discusses possible legal impediments to the establishment by a school board of a no-smoking policy.

797. O'Banion, Dan R. "The chemical problem" from An Ecological and Nutritional Approach to Behavioral Medicine, p69-164, Springfield, Ill.: Charles C. Thomas, 1981.

One of the most important settings that influences a child's life is the school environment. This environment should be kept relatively uncontaminated especially for chemically sensitive children whose learning may be greatly affected by reactions to chemicals; however, even less chemically sensitive individuals who appear not to have any dramatic problem learning may be affected by such exposures. Slight fatigue, sleepiness, and uncooperativeness are often produced by chemical exposure and easily corrected by cleaning up the chemical environment in the school setting. Yet, the school environment is one of the most chemically contaminated environments in our society. A wide variety of indoor air pollutant sources in schools is described, including the use of pesticides, motor exhaust, chemicals in clothing, and lighting. How these affect learning and behaviour in children is documented.

*798. O'Connor, Aleda. The allergic classroom: a case study in how modern school environments endanger teacher and child. Reporter, v9 n3 p38-39, Dec. 1983.

The plight of students and teachers allergic to some or all of the many environmental pollutants in the modern school environment is chronicled. School boards must become aware of the extent of the problems caused by the indoor school environment before they can begin to make adjustments to meet the needs of sensitive students and staff. Some measures which could minimize exposure to offending substances are proposed. A support group "The Allergy Information Association" formed to assist sufferers and their families is discussed.

799. Olsen, Jorgen H. and Martin Dossing. Formaldehyde induced symptoms in day care centers. American Industrial Hygiene Association Journal, v23 p366-370, May 1982.

A questionnaire study was performed among 70 employees at seven mobile day care centers where urea-formaldehyde-glued particle board has been used for indoor panelling and among 34 employees at three control institutions selected at random where no particle board has been used as building materials. Responses showed a significantly higher frequency of the following symptoms among the staff at the mobile institutions: mucous membrane irritation, headache, abnormal tiredness, menstrual irregularities and use of analgetics. The median concentration of formaldehyde in the mobile institutions was 0.43 mg/m 3 in contrast to a concentration in the control institutions of about 0.08 mg/m 3.

**800. Ontario. Ministry of Education. Thermal Environment in Schools. Toronto: Ontario Ministry of Education, School Planning and Building Research Section, April 1971. 40p. Available ERIC. ED 061 576. Microfiche only.

This publication attempts to provide some basic descriptions of the various systems and components of climate control and to point out some of the factors to be considered in the selection of the mechanical equipment. The principles of heat gain and loss and ventilation as they relate to a comfortable temperature are discussed. Illustrative figures accompany the written text.

**801. Peccolo, Charles. The Effect of Thermal Environment on Learning, A Pilot Study. Iowa City: Iowa University, Centre for Research in School Administration, 1962. 33p. Available ERIC. ED 016 356.

This study aimed at measuring the effects of thermal conditions on the learning process and on learning. The concern was to study the model environment as now established by research and writings and to compare it with a marginal environment. The fourth grade subjects used were tested in various functions under two contrasting thermal environments which differed in temperature, humidity, and air movement. The first piece of research showed definite benefits for children in a carefully controlled thermal environment. However, school boards and superintendents should not embark on ambitious programs to air condition schools using this research as the sole basis for doing so. This research along with other evidence can give strong support for consideration of thermal conditions in planning schools. This digest includes -- (1) introduction to the problem, (2) development of the thermal concept and a review of the literature, (3) experimental procedures and conditions, (4) analysis of the results, and (5) summary and conclusions. Charts, graphs and tables are included.

802. Pengelly, L.D. and others. The Hamilton Study: Relationships Between Indoor and Outdoor Levels of Sulphur Dioxide, Nitrogen Dioxide and Particulates in Elementary Schools. Pittsburgh, Pa.: Air Pollution Control Association, 1982.

Indoor and outdoor air pollution levels in 12 Hamilton, Ontario schools were analysed. Analysis of the results of sulphur dioxide, nitrogen dioxide and particulate measurement was carried out to determine the influence of school age and outdoor concentration on the measured indoor level. Results showed that the design and construction of a building had an influence on the indoor level of nitrogen dioxide over a range of outdoor nitrogen dioxide levels. The authors speculate that the principal factor which influences this relationship is the infiltration or ventilation rate. Newer schools tend to have positive ventilation systems which draw in "fresh air" from the outside; old schools did not have methods for providing for ventilation aside from opening windows.

**803. Perkins and Will, Architects. Climate Conditioning for the Learning Environment. Chicago, Ill.: Perkins and Will, Architects, 1968. 15p. Available ERIC. ED 025 109.

This booklet discusses heating, cooling, and ventilation for the classroom in relationship to students' learning abilities. It is designed to assist school boards, administrators, architects and engineers in understanding the beneficial effects of total climate control, and in evaluating the climate conditioning systems available for schools. Discussion includes -- (1) the physiology of comfort, (2) comfort design, (3) climate control engineering, (4) climate control systems, (5) the total electric concept.

**804. Perkins and Will, Architects. The Learning Environment. Chicago, Ill.: Perkins and Will, Architects, 1968. 24p. Available ERIC. ED 024 231.

The basic factors in personal comfort, the nature of the processes of teaching and learning, and the effects of environment on these functions are discussed. The role of climate conditioning and space conditioning as interpreted by sensory factors during the learning process gives guidelines for design solutions. Technical supplements on climate and space conditioning are planned for the future.

805. Pfeifer, J. and others. Alterations of selected indicators of local immunity in children having been exposed to the action of formaldehyde of a long duration. Czechoslovakia Pediatrie, v38 n5 p274-277, 1983.

A group of schoolchildren who had undergone long-term exposure to formaldehyde as well as a non-exposed control group were studied. This long-term study (3 years) looked at 159 children. Decreased values of salivary SIgA and of lysozym were repeatedly observed in exposed children and after elimination of the exposure, a prompt normalization of the findings were seen. A statistically significant higher occurrence of abnormal findings in the studied immunity indicators could also be demonstrated. On the basis of data, the authors consider buildings built of prefabricated woodchip board made with the use of a formaldehyde glue to be unfit for the long-term use of children.

**806. Phoenix Union High School District. The Effect of Air-Conditioning on Student and Teacher Performance. Phoenix, Ariz.: Phoenix Union High School District, Dept. of Research and Planning. Jan. 1973. 6p. Available ERIC. ED 131 580.

The literature is reviewed to see if research shows a relationship between student and teacher performance and air conditioning of classrooms. The benefits of air conditioning in promoting learning are substantiated by studies that are summarized but not cited. The relationship of the report to the Phoenix Union High School System Advisory Council's high priority on air conditioning and the North High School air conditioning project is mentioned.

807. Pollution and education. Scope, Feb. 1986.

This article provides a concise overview of the Toronto Board of Education report commissioned to study the potential effects of a polluted environment on learning and to investigate the safety of the school environment. The report "Recommendations for Action on Pollution and Education in Toronto" provides numerous recommendations for removing potential irritants, educating teachers and parents to recognize the symptoms of environmental sensitivity, and establishing mechanisms for ongoing evaluation of the school environment.

808. Randolph, Theron G. "Air pollution" in Human Ecology and Susceptibility to the Chemical Environment, p35-62, Springfield, Ill.: Charles C. Thomas, 1976.

Environmental pollutants, both indoor and outdoor, can have debilitating mental and physical effects, especially on highly susceptible persons. The major sources of air pollution in homes and public places, such as schools, are: fuels, solvents and their combustion products; refrigerants and spray containers; insecticides; sponge rubber; plastics; mechanical devices; automobiles; and scented cleaning products. Indoor chemical air pollution of schools as a contributing cause of poor scholastic performance of susceptible children and the dopiness and confusion of susceptible teachers is rarely diagnosed correctly. The problem presented by indoor air pollution is sufficiently acute to warrant the transfer of certain highly susceptible students and teachers to more satisfactorily located, constructed, equipped, heated and ventilated classrooms or schools.

809. Randolph, Theron G., and Ralph W. Moss. An Alternative Approach to Allergies. Toronto: Fitzhenry and Whiteside Ltd., 1980.

Many physical and mental illnesses are caused by our increasingly contaminated environment. For those who are susceptible, everyday chemicals (gas from the kitchen range, supermarket food additives, cleaning compounds, automobile exhaust, etc.) can be a cause of mental and physical disease. Use of chemicals in schools can contribute to the overall chemical and food problem and cause poor performance by both children and teachers. Poorly designed heating and cooking systems are a major source of trouble, as are janitorial chemicals, office and art supplies. Studies of indoor air pollution in schools have been conducted with resulting anecdotal proof of cause and remedy.

810. Rapp, Doris J. Allergies and the Hyperactive Child. New York: Simon and Schuster, 1980.

Many exposures in school are capable of causing symptoms in children. Hyperactivity, fatigue, behaviour and personality problems, headaches, abdominal complaints, asthma, runny nose, watery eyes, hives are all symptoms of exposure to pollutants in schools.

811. Rogers, Sherry A. When your home makes you sick. Bestways Magazine, p8,11, February 1985.

Formaldehyde is just one of a variety of chemicals capable of causing environmentally-induced illness. During the past 10 years, people with recently foam-insulated homes have enabled us to study on a grand scale hundreds of victims and their symptoms. Common symptoms include headaches, nausea, dizziness, lethargy, flushing, laryngitis, depression, dopiness, extreme weakness, muscle spasms, joint or muscle pains, vomiting, violent mood swings, and confusion or disorientation. Case studies are presented of a student exposed to formaldehyde in carpets and panelling as well as leaking gas jets in the school science lab, and a teacher exposed to formaldehyde from building materials used in school renovations.

*812. The Royal College of Physicians and Surgeons of Canada. Policy Statement -- Cigarette Smoking. Ottawa: RCSPC, 1986. 4p.

Teachers and Parent-Teacher and Home and School Associations are called upon to join in the campaign for a smoke-free environment by encouraging the implementation of specific educational programs that recent Canadian trials have shown to be efficacious in reducing the rates at which children start to smoke and by establishing restricted smoking areas in all schools to protect non-smokers from second-hand smoke. A summary of evidence on smoking and health is included as well as further recommendations.

**813. Rutgers, Norman. Thermal Environments. Reno: Nevada Univ., Dept. of School Administration. June 1967. 20p. Available ERIC. ED 025 116.

The role that a good thermal environment plays in the educational process is discussed. Design implications arise from an analysis of the heating and ventilating principles as they apply to vocational-technical facilities. The importance of integrating thermal components in the total design is emphasized.

814. School allergy may be no joke. Chicago Sun Times, Aug. 1981.

Dr. Leonard Caputo, an allergist from Mobile, Alabama, is quoted as saying that allergy to school could be easily classified as an occupational hazard due to the large number of allergenic and irritating materials to which students are exposed. In a paper prepared for the annual Congress of the American College of Allergists, Caputo cites dust, chalk dust, industrial waxes, cleaners, felt-tipped markets, carpets, and mould in libraries as being some of the substances that cause poor school performance.

815. Schreiter, Ann. Human Ecology in the Schools and A Follow-up to Human Ecology in the Schools. Kitchener, Ont.: Human Ecology Foundation of Canada, 1984.

These two documents discuss causes of and solutions for chemical sensitivity in children in the school system. Suggestions are made for reducing the chemical load on children and teachers. A ban on smoking in schools is recommended. Other solutions that have been used in actual situations of chemical sensitivity are discussed.

*816. 65 St. Clair Ave. E. becomes smoke-free zone. Reporter (CT), v12 n1 p17, 1986.

Measures taken to reduce smoking and exposure to second hand smoke in schools and teacher association offices are discussed.

817. Steensberg, Jens. Indoor climate problems in institutions for children -- practical, administrative and policy perspectives. Indoor Air, v1 p179-180, 1984.

This study illustrates the administrative and policy perspectives of environmental health decision making. Examples of practical indoor climate problems in institutions for children are given.

*818. Steffens, Heidi. Warning: is your school safe? NEA Today, p4-5, November 1984.

Unseen toxic hazards inhabit school buildings, with asbestos being the tip of the iceberg. Toxic hazards can be found in art rooms, science labs, vocational shops, with art classrooms possibly the most dangerous. Art supplies, including those designed for young children, contain substances that can cause cancer or damage to the reproductive, nervous, and respiratory systems, the heart, and other vital organs. The many energy-efficient, air-tight school buildings constructed during the past decade create another set of problems through lack of ventilation and access to outside air. These toxic hazards pose two types of health risks. An acute exposure will result in immediate and visible symptoms. The more insidious danger is from chronic exposure.

*819. Thomas, Keith. Grandview school - a story of frustration. MAST Journal, v9 n2 p13-16, Oct. 1982.

Inability to diagnose the cause of numerous incidents of sudden illness among staff and students in the Spring and Fall months caused a large rural school to be opened and closed several times while experts checked all sources of incoming air. After much study it was finally determined that certain combinations of outdoor temperature and wind velocity could cause boiler exhaust emissions to fall rather than rise and enter the school via the air conditioning system. This condition combined with the "tight building" syndrome in modern heavily insulated buildings could cause the gases to be trapped in certain areas of the building. Investigators hope that raising the chimney height and maintaining a stricter boiler maintenance schedule will solve the problem.

820. "20th century disease" kids get separate special class. Toronto Star, March 27, 1985.

This newspaper article describes action taken by the principal of a secondary school in Kitchener, Ontario, to provide a special low-pollution classroom for use by students who are hypersensitive to low levels of indoor air pollutants.

**821. Wayne, W.S., and P.F. Wehrle. Oxidant air pollution and school absenteeism. Paper presented at the session on epidemiology at the annual meeting of the American Public Health Association, November 12, 1968. Archives of Environmental Health, v19 p315-322. September 1969. NIOSH-00009353.

Absence rates attributed to respiratory illness were studied in relationship to oxidant concentrations in two elementary school populations by school year, season, week, and day. The analysis revealed no evidence of statistically significant associations between absence rates and oxidant levels. The pattern of absence rates for respiratory symptoms was similar at both schools. Rates were highest in winter and usually greater on Monday and Friday than on other days. In contrast, oxidant levels were lowest in winter and usually higher in the middle of the week than on Monday and Friday. Substitution of standardised daily absence ratios for absence rates in the analysis of the day-of-week data in relationship to oxidant concentrations confirmed the basic results of the study.

*822. Will children's learning be stunted, and teachers irked by low school temperatures? American School Board Journal, v161 n1 p34,43-45, Jan. 1974.

High room temperatures can actually be harmful to children and teachers.

**823. Wyse, D.M., and D. Malloch. Christmas tree allergy: mould and pollen studies. Paper presented at the annual meeting of the Canadian Society of Allergy and Clinical Immunology, June 20, 1969. Canadian Medical Association Journal, v103 p1272-1276, December 5, 1970. NIOSH-00010640.

The authors have attempted to determine some of the possible causes of Christmas tree allergy, both by clinical means and by direct observation of particles brought in on the tree. A history of respiratory or other allergic symptoms during the Christmas season is occasionally obtained from allergic patients and can be related to exposure to conifers at home or in school. Of 1657 allergic patients, respiratory and skin allergies to conifers occurred in 7%. This seasonal syndrome includes sneezing, wheezing, and transitory skin rashes. The majority of patients develop their disease within 24 hours, but 15% experience symptoms after several days. Mold and pollen studies were carried out in 10 test sites before, during, and after tree placement in the home. Scrapings from pine and spruce bark yielded large numbers of Penicillium, Epicoccum, and Alternaria, but these failed to become airborne. No significant alteration was discovered in the airborne fungi in houses when trees were present. Pollen studies showed release into air of weed, grass, and tree pollens while Christmas trees were in the house. Oleoresins in the tree balsam are thought to be the most likely cause of the symptoms designated as Christmas tree allergy.

*824. Brooks, Gail E. How have unions addressed the issue of VDT users' health and safety. Labor Law Journal, v37 n9 p668-675, Sept. 1986.

This paper discusses the health and safety concerns related to the expanded use of VDT's in the workplace and the ways in which unions are seeking to address those concerns through research, organizing and bargaining activities, and legislative action.

825. Calhoun, Lawrence. VDT's through rose colored glasses. American School and University, v56 n5 p16, Jan. 1984.

Students using microcomputers for extensive periods of time are prone to the same problems as those experienced by video display terminal operators. Suggested guidelines include adjustable furniture and equipment, avoidance of eye strain, control of screen brightness and contrast, and specially prescribed glasses.

826. DeMatteo, Bob. Terminal Shock: the Health Hazards of Video Display Terminals. Second Edition. Toronto: NC Press Ltd., 1986. 240p.

This book discusses all aspects of the VDT environment including potential radiation, musculoskeletal, visual, stress, chemical and ultrasound hazards. A section on negligence and legal liability reviews current and proposed legislation and collective agreement provisions with examples from U.S., U.K., Scandinavia, Europe and the International Labour Organization. Representative workers' compensation claims are reviewed. Preventive measures are discussed. The author is the Coordinator of Occupational Health and Safety for the Ontario Public Service Employees Union directing occupational health and safety research, educational planning and social policy analysis.

827. Dolecheck, Carolyn Crawford. Ergonomic design and VDT equipment: what educators should be teaching. Balance Sheet, v66 n2 p33-37, Nov.-Dec. 1984.

Discusses human factors (ergonomic) requirements in equipment design for video display terminals and the work environment.

828. Gallina, P.L. Terminaux à écran de visualisation: bibliographie et notes sélectives sur l'hygiène et la sécurité au travail. Hamilton: Centre canadien d'hygiène et de sécurité au travail, 1983.

829. Gallina, P.L. Visual Display Terminals (VDTs): An Occupational Health and Safety Bibliography With Selected Annotations. Hamilton: Canadian Centre for Occupational Health and Safety, 1983.

*830. Hathaway, Michael D. Variables of computer screen display and how they affect learning. Educational Technology, v24 n1 p7-11, Jan. 1984.

Reviews research findings on variables in computer screen displays and their effects on learning for use by purchasers or designers of computer systems for instructional purposes. Variables discussed include fatigue, density of displayed text, scrolling, upper-case versus upper- and lower-case lettering, letter size, and graphics. Ten references are listed.

831. Lambert, Colin. Visual Display Terminals. Ottawa: Canadian Union of Public Employees, 1979. 39p.

This booklet discusses four major hazards associated with the operation of VDT's: visual, physical, psychological (stressors) and radiation. Sample collective agreement articles to protect VDT operators are presented.

832. Marha, K. Champs électriques de très basses fréquences près des terminaux à écran de visualisation et un moyen de les éliminer. Hamilton: Centre canadien d'hygiène et de sécurité au travail, 1983.

833. Marha, K. VLF -- Very Low Frequency Fields Near VDTs and an Example of Their Removal. Hamilton: Canadian Centre for Occupational Health and Safety, 1983.

834. Marha, K., et autres. Dangers d'exposition aux champs de très basses fréquences des terminaux à écran de visualisation; facteurs justifiant d'autres recherches et l'utilisation du blindage. Hamilton: Centre canadien d'hygiène et de sécurité au travail, 1983.

835. Miller, R. Bruce. Radiation, ergonomics, ion depletion, and VDT's: healthful use of visual display terminals. Information Technology and Libraries, v2 n2 p151-58, June 1983.

Discusses health hazards associated with use of visual display terminals (VDT's) and provides guidelines for safe use of VDT's in the following areas: radiation, design of work stations, design of VDT's, illumination, glare, work/rest periods, visual testings, ion depletion. An 11-item annotated bibliography is included.

**836. Murray, William E.; and Others. Potential Health Hazards of Video Display Terminals. Cincinnati, Ohio: National Institute for Occupational Safety and Health, Div. of Biomedical and Behavioral Science, 1981, 85p. Available ERIC. ED 222 183.

In response to a request from three California unions to evaluate potential health hazards from the use of video display terminals (VDT's) in information processing applications, the National Institute for Occupational Safety and Health (NIOSH) conducted a limited field investigation of three companies in the San Francisco-Oakland Bay Area. A preliminary walk-through survey was conducted in November 1979, followed by an additional four-phase, in-depth investigation in 1980, which used (1) radiation measurements; (2) industrial hygiene sampling; (3) a survey of health complaints and psychological mood states; and (4) ergonomics and human factors measurements. The radiation surveys indicated exposure well below current occupational exposure standards. Air samples showed no hazardous chemical exposures. A questionnaire survey indicated that a higher percentage of VDT operators reported more visual complaints at two of the three sites, more muscular complaints at one site, and more emotional complaints at all sites. Ergonomic evaluation indicated measured illumination levels at VDT workstations were generally acceptable, although problems of glare and physical dimensions of the workstations were sometimes noted. The report of this study provides detailed explanations of methodologies, tabulated results, general recommendations, and a 3-page reference list.

837. New light on computers. American School and University, v56 n10 p24-26,28, June 1984.

Four architects' lighting designs are presented which cut down glare in offices and classrooms with computers.

*838. Parker-Jenkins, Marie and William Parker-Jenkins. Improving school lighting for video display terminals. Canadian School Executive, v3 n7 pp. 20-22, Jan. 1984.

The proliferation of VDT's in schools requires a reassessment of school lighting techniques. This article provides detailed lighting recommendations to reduce operator fatigue and eyestrain. Other aspects of the physical environment such as noise, temperature and room decor are also addressed.

839. Spinner, B., and others. Case for Concern About Very Low Frequency Fields From Video Display Terminals: Need for Further Research and Shielding of VDTs. Hamilton: Canadian Centre for Occupational Health and Safety, 1983.

*840. Stinson, Jane. Technological Change and Working Women. Ottawa: Canadian Union of Public Employees, 1981.

Health and safety with respect to the use of video display terminals is one of the issues discussed. A checklist which can be used to correct many of the health and safety hazards currently experienced by word processing operators is included.

*841. Treurniet, W.C. Review of Health and Safety Aspects of Video Display Terminals. Ottawa: Canada. Department of Communications, 1982. 36p.

The paper reviews the factors that contribute to worker complaints when video display terminals are introduced into the workplace. Survey data from field experiments indicate that a number of ergonomic factors and job characteristics can contribute to reports of discomfort from VDT users. Specifically, reports of visual discomfort are related to improper ambient lighting (which can cause bothersome reflections and contrast glare), poor display quality, and ophthalmological deficiencies. Reports of muscle pain and fatigue are related to poor workstation design such as improper heights of chair, keyboard, and display screen, and absence of source document holder, and no support for the forearms and wrists. The literature suggests further that the frequency of such complaints is influenced by the worker's attitude regarding the job. A negative attitude arising from performing a meaningless, routine task, or from having no opportunities for career advancement, will result in more complaints due to ergonomic shortcomings.The review also considers the issue of electromagnetic emissions from television displays. Recent surveys show that modern VDT's do not emit detectable radiation.

842. Walsh, Janet. The eyes have it. Classroom Computer News, v3 n1 p32-33, Sept.-Oct., 1982.

Discusses the health hazards of working with the visual display systems of computers, in particular the eye problems associated with long-term use of video display terminals. Excerpts from and ordering information for the National Institute for Occupational Safety and Health report on such hazards are included.

*843. Yeaman, Andrew R.J. Put your computers in the most efficient environment. Instructional Innovator, v29 n1 p32, Jan. 1984.

Discusses factors that should be considered in selecting video display screens and furniture and designing work spaces for computerized instruction that will provide optimal conditions for student health and learning efficiency. Use of work patterns found to be least stressful by computer workers is also suggested.

VISUAL ENVIRONMENT

844. Academic performance of students is improved by good lighting. Modern School. p12-14, May 1970.

A chart accompanying the article gives levels of illumination for schools as currently recommended by the Illuminating Engineering Society.

845. American standard guide for school lighting. Illuminating Engineering, April 1962.

This is a guide for school lighting, designed for educators as well as architects. It makes use of research, notably the Blackwell Report on Evaluation of Visual Tasks. The guide begins with an overview of changing goals and needs of school lighting, and a tabulation of common classroom visual tasks that require variations in lighting. Visibility variables are discussed, such as size, contrast, reflectance, glare, and quality of illumination. The characteristics, advantages, and methods of using electric lighting and daylighting are described, followed by a discussion of illumination maintenance and design procedure. The guide concludes with special applications of these principles, using examples ranging from art rooms to swimming pools. Appendices list the Blackwell experiments, the Scissors curve graph, instruments used in the lighting survey, and definitions of terms.

846. Arnold, Anne Jurmu. "Illuminating behaviour": what's new department. Today, v13 n1 pp. 25-26, Nov. [Fall] 1983.

**847. Baas, Alan M. Luminous Environments. Educational Facilities Review Series Number 15. Eugene: Oregon Univ., ERIC Clearinghouse on Educational Management, March 1973. 10p. Available ERIC. ED 072 513.

The lighting of a school building should be considered an active element of the total educational environment. In addition to ensuring efficient performance of visual tasks, a good lighting system contributes significantly to the aesthetic and psychological character of the learning space. Recent literature on school illumination recommends a combination of natural and artificial lighting. Several documents cited in this review give evidence that reliance on artificial light sources alone may have adverse biological repercussions. Other documents describe lighting problems peculiar to open plan schools. The trend in luminous design provides for maximum lighting flexibility through use of both fluorescent and incandescent lamps.

**848. Birren, F. The effects of color on the human organism. American Journal of Occupational Therapy, v13 n3 6p, June 1959. NIOSH-00059203.

The effects of colour on the human organism are discussed. Topics include: general attitudes toward colour, simple effects of light and colour, human reactions and responses, physiological effects, sensory effects, the work of Robert Gerard, theoretical and practical implications, and colour in everyday life. The conclusions are that there is in colour and light both centrifugal and centripetal actions; and that in psychological realms, experimental work in schools and hospitals has emphasized the importance of colour. Outwardly integrated persons, "nervous" persons, and small children will find relaxation in an actively coloured environment since visual and emotional excitement in the environment will effectively "match" the spirits of such persons and set them at ease. Inwardly integrated persons will ordinarily prefer a more sedate environment as it will provide the equanimity they innately prefer.

**849. Birren, F. The ophthalmic aspects of illumination, brightness and color. Transactions of the American Academy of Ophthalmology and Otolaryngology, pages 566-584, June 1948. NIOSH-00059164.

A resolution in the conflict in current literature on illumination, brightness and colour is attempted in this review which brings together data from medical and lighting authorities with emphasis on the concepts of the ophthalmologist. It is contended that the problems of illumination, brightness and colour in the creation of ideal seeing conditions cannot be solved from the standpoint of optics alone, that physiologic, neural and psychologic factors must be considered. Arguments for both higher and lower levels of light intensity are refuted. If the equipment of a room is dark in colour and cannot be changed, light levels beyond 25 or 30 foot-candles are considered to cause trouble. If higher brightness can be introduced in equipment (but not beyond reflectances of 60%, except on ceilings) higher light levels may also be introduced and very excellent seeing conditions may be achieved. Thus great increases of light intensity in average American offices, factories and schoolrooms are considered impractical unless a tremendous amount of cooperative effort in brightness engineering is shown by fabricators of flooring materials, desks, filing cabinets, machinery, woodwork, paints, etc. Low brightness contrasts are considered desirable. Glare should be overcome. However, the theory of uniform brightness is considered both impractical and misleading. Seeing is at its best where the brightness of the task moderately exceeds the brightness of its surroundings. Monotony should be avoided.

850. California School Lighting Design and Evaluation. A Procedure for the Prediction, Specification, and Evaluation of Visual Comfort and Visual Performance in Classrooms. Sacramento: California State Dept. of Education, 1978. 42p. ED 158 359. Not available ERIC.

This guide is intended to help school administrators, members of school district governing boards, architects, and engineers objectively evaluate school lighting systems. The California school lighting design and evaluation procedure described provides a step-by-step design method that, when used properly, results in balanced lighting for school facilities. The procedure also provides for a separate assessment and rating for visual performance and visual comfort, making possible calculated options between these two basic lighting design factors. Basically, this document is a designing tool for engineers with specific responsibility for illumination. Metric equivalents in parentheses are included in parts of the text. The appendices contain formulas for calculating the measures presented in the text, worksheets, a completed sample form, and a computer printout of a proposed lighting system. A glossary contains terms, abbreviations, and symbols used in the text.

851. Canadian Standards Association. School Lighting. Ottawa, 1967.

*852. Carl, David. Vision and visual comfort. Audiovisual Instruction, v22 n7 p18-19, Sept. 1977.

Visual comfort and legibility are not the same thing. Visual comfort is the light brightness range between glare and insufficient light. Eye adjustment to changing light levels is described.

853. Crouch, C.L. Better lighting through research. American School and University, May 1966.

Research revolutionizes school lighting and buildings. New educational concepts demand flexible lighting design. Visual and auditory aids must be considered. Light required on the task depends on the detail to be seen involving its configuration, size, and contrast with its background. The brightness of surroundings must be designed to balance that of the task. Colour usage also affects the luminous environment. Measurement of required illumination can be made with the visual task evaluator. Optimum visibility occurs when the brightness of the surroundings is equal to or a little less than the brightness of the task. Surroundings should not be less than one-fifth the brightness of the task, and preferably one-third. Discomfort glare criterion is applied in the selection of lighting units. Luminous ceilings reduce veiling reflections to a minimum. Included are a table of illumination levels and surface reflectances for schools that are currently recommended, and a sketch showing the potential sources of specularly reflected glare as well as a simple test for discomfort glare.

854. Department of Education and Science. Colour in School Buildings. (Fourth Edition). London, England: Department of Education and Science, 1969. 67p. ED 056 389. Not available ERIC.

This bulletin discusses the use of color in school buildings and describes those colors specifically designed for use in schools. Part I discusses the difficulty of using color in physical environments where many different and often conflicting needs must be met, encourages the systematic consideration of these needs, and suggests principles or criteria that could help color-scheme designers. Part II describes a specific range of colors -- the Archrome 2 -- a 54-color range considered to be most suited for use in schools. Eight extensive appendices elaborate on the principles discussed and supply a variety of detailed illustrations.

855. Department of Education and Science. Lighting in Schools. London, England: Department of Education and Science, 1967. 72p. ED 035 240. Not available ERIC.

The application of good lighting principles to school design is discussed. Part 1 of the study is concerned with the general principles of light and vision as they affect lighting in schools. Parts 2 and 3 deal with the application of these principles to daylighting and artificial lighting. Part 4 discusses the circumstances in which the daylighting and the artificial installation can be designed to be used together. Part 5 and Appendices 1 and 2 consider in greater detail some of the problems which arise in lighting specific spaces in the school, in lighting for the partially-sighted and in remodeling old schools. Many drawings, diagrams, and photographs supplement the text.

856. Erber, Norman P. Illumination factors in the design of classrooms for deaf children. Volta Review, v81 n4 p226-35, May 1979.

The illumination of three conventional classrooms was modified to create optical conditions better suited to visual communication for hearing impaired students.

857. Estes, R.C. Quality lighting for the learning environment. School Business Affairs, v50 n1 p44-45, Jan. 1984.

A Houston, Texas, school district has found that indirect lighting fixtures combined with skylights lower energy bills and provide softer, more natural lighting. A principal feels the softer light may have a calming effect on students' behavior.

858. Faily, Anwar, and others. The impact of color and lighting in schools. CEFP Journal, v17 n5 p16,18, Sept-Oct. 1979.

Findings of some of the research on the impact of color and lighting on the teaching-learning process.

859. Fletcher, Donna. Effects of classroom lighting on the behavior of exceptional children. Exceptional Education Quarterly, v4 n2 p75-89, Sum. 1983.

The effects of classroom lighting methods on activity level, achievement, visual acuity/fatigue, and health of nonhandicapped and handicapped students are reviewed. Effects of different levels of illumination on behaviour are also discussed. Methodological deficiencies and lack of replication have resulted in few tenable conclusions.

860. Gardner, John C. How much light is enough? American School and University, v43 n5 p14-16, Jan. 1971.

New lighting design and fixture standards improve classroom lighting through glare reduction.

861. Graves, Ben E. Shedding light on learning. American School and University, v57 n7 p88,90, March 1985.

Summarizes findings of an Alberta light/color study that looked at mood, noise levels, IQ test scores, blood pressure, and absences under fluorescent or full-spectrum light in two color schemes in four elementary schools with 700 students.

862. Growing importance of emergency lighting. American School and University, v47 n6 p57-58,60, Feb. 1975.

As schools and colleges become used increasingly for community activities -- especially at night -- emergency lighting becomes more and more critical.

**863. Harmon, Darell Boyd. The Co-ordinated Classroom. Grand Rapids, Mich.: American Seating Co., 1951. 52p. Available ERIC. ED 020 621.

This report explicates the physical relationship of the child to his classroom environment in terms of light control. The study shows how shadows, glare, inadequate light distribution, desks and desk positions affect the child's physiological and psychological well-being. A comparative study was made between a control school and an experimental school to measure learning achievement in a light controlled and non-light controlled environment. The effects of light diffusion on desks, chalkboards, interior walls and ceilings are examined in relation to the child's vision and posture. The report also presents a study on the relationship between visual, dental and posture problems and body stress. This publication is also available upon request from American Seating Company, Grand Rapids, Michigan.

**864. Hartman, Michael. The Luminous Environment of the Classroom. A Selected and Annotated Bibliography. Madison: Wisconsin Univ., ERIC Clearinghouse on Educational Facilities, 1968. 17p. Available ERIC. ED 024 250.

Presentation of an environmental reference source for architects and designers includes separate listing of 19 short overview articles and 43 documents with an implicit specification orientation toward classroom lighting. The major document content areas are -- (1) general specification guides with some psycho-physiological background, (2) evaluation of human responses to various environmental aspects, (3) mechanical system evaluations, (4) control of a specific aspect of the luminous environment, and (5) environmental rating systems.

865. Hathaway, Warren E. Lights, windows, color: elements of the school environment. CEFP Journal, v21 n3 p33-35, May-June 1983.

Summarizes research findings about the lighting and colours used in classrooms -- specifically, students' reactions to colour; windowless rooms; and natural, incandescent, and fluorescent lighting.

**866. Hathaway, Warren E. Lights, Windows, Color: Elements of the School Environment. Paper presented at the 59th Annual Meeting of the Council of Educational Facility Planners, International, Columbus, Ohio, September 26-29, 1982. Edmonton: Alberta Education, 1982. 28p. Available ERIC. ED 226 423.

Recent research indicates there are a great many nonvisual effects of light on people. The control of rickets and the suntan effect are well understood. Less well known effects include synchronization of a number of physiological rhythms and prevention and control of infantile jaundice. Physiological and psychological effects also vary with the type of artificial light, whether it is from incandescent or cool-white or full-spectrum (daylight) fluorescent lamps. Student behavior appears to be favorably affected by full-spectrum lamps. Color also has an effect on people and their behavior. Research suggests that blues and greens tend to foster relaxation while shades of red or orange tend to induce activity. In discussions of windows versus windowless space, building occupants seem to favor the ability to view the outside world. If the effects reported in the studies that have been undertaken to date can be replicated, educators and school facility designers should be able to design classrooms capable of producing desirable and predictable student behaviors.

867. Henderson, S.T., and A.M. Marsden. Lamps and Lighting. (2nd Edition) London, England: Edward Arnold Publishers, 1972. 602p. NIOSH-00050447.

This manual contains 34 contributions from different authors on the following topics: fundamentals (light, vision, colour, photometry, colourimetry, lighting data and computations); lamps (lamp materials, phosphors, incandescent lamps, tungsten halogen lamps, photoflash lamps, fluorescent lamps, sodium lamps, mercury lamps, metal halide xenon and neon lamps, electroluminescent devices, semiconductor lamps); luminaires and circuits (electrical circuits for lamps, design and manufacture of luminaires, optical control in luminaires); and lighting (electric lighting of interiors, daylight in interiors, industrial lighting, office lighting, shop lighting, school and hospital lighting, state and studio lighting, transport lighting, installation, maintenance and economics). Lamp data, a glossary of terms, conversion tables to SI units, standards and technical reports and a bibliography are appended.

868. Here's a checklist to rate the school lighting system. Modern School, p6-7 March 1970.

**869. Hodges, J.A. The Lamp That Kills Germs. Cleveland, Ohio: Lamp Department, General Electric Company, 1977. 32p. NIOSH-00059311.

The ultraviolet rays of sunlight kill microorganisms. Ultraviolet lamps have been developed with the same qualities. The hazards of this radiation are noted, and practical applications are described. Studies have reported reductions in respiratory infections in hospitals, schools and military quarters, in animal and poultry houses, in meat coolers, fruit and vegetable coolers, canning and bottling plants, water purifying, bakeries, sugar manufacturing and the production of pharmaceuticals, chemicals and biologicals. The use of these lamps in protecting the public in public places is projected.

870. Hughes, Philip C. School lighting for the total person: a psychobiological approach. CEFP Journal, v19 n2 p4-7, Mar-Apr. 1981.

Reviews the established effects of light on the human organism and concludes that sunlight simulating environmental lighting in schools will result in greater student and teacher comfort, health, and increased performance and/or working capacity.

**871. Illuminating Engineering Society. Recommended levels of illumination. Illuminating Engineering, p416-432, August 1958. NIOSH-00033710.

The Blackwell method of determining illumination required for visual tasks is described and compared with previously used methods. Recommendations for quality and quantity of illumination are given, with data on the required brightness, reflectance, and required illumination for 56 practical tasks of varying difficulty. Recommended illumination levels are listed for industrial areas, institutions, offices, stores, residences, marine transportation, churches and synagogues, and schools.

872. Ingraham, Leon. Electromagnetic Radiation and Student Off-Task Behaviour. Edmonton: Alberta Education, Planning Services Branch, July 1983.

The effects of electromagnetic radiation emitted from fluorescent lights on the off-task behaviours of grade three school pupils was studied. The independent variable was the level of electromagnetic radiation which was eliminated by grounding and shielding the fluorescent light fixtures in the experimental classroom. The off-task behaviours were recorded by a reliable on-sight observer for two groups of pupils. For the intact classroom group (comprised of all pupils and heterogenous with respect to hyperactivity) the elimination of electromagnetic radiation decreased significantly the rate of off-task behaviours. For triad groups (groups of three pupils selected as being most "hyperactive") the results were mixed and inconclusive. Contrary to expectations, pupils from this latter group who were prone to hyperactivity, demonstrated no benefit from the elimination of electromagnetic radiation. Further studies are suggested.

873. Innovative design for gym. American School and University, v48 n1 p66, Sept. 1975.

A new gymnasium at West Valley College in Daratoga, California, combines natural light from an indirect source with electrical lighting, thereby eliminating glare.

**874. Kleiber, Douglas A., and others. Environmental Illumination and Human Behavior: The Effects of Spectrum of Light Source on Human Performance in a University Setting. Ithaca, N.Y.: Cornell Univ., Center for Improvement of Undergraduate Education, 1973. 55p. Available ERIC. ED 080 038.

Two experiments tested the general question of whether a more "natural" artificial light (Vita-Lite) would have any different effects on classroom behavior and the ability to study than would a traditional (cool-white) light source. Fifty-nine undergraduates took part in the first experiment that utilized an 8-week counterbalanced design. Videotapes of classroom behavior and post-seminar questionnaires indicated no significant differences in variables dealing with classroom interaction, seminar effectiveness and mood. A follow-up questionnaire did show however, that upon direct appraisal, the Vita-Lite was perceived as stronger, more stimulating, brighter and more harsh than the cool-white light source that was considered softer and more relaxing. Using a similar research design, a second experiment showed that on physiological measures, most subjects showed less fatigue after a study session under the Vita-Lite than under the cool-white light. No significant differences in subjective estimates of fatigue were identified. A newly designed graphic technique was used to illustrate and support the data analysis and implications were drawn about the use of environmental information by educators and designers. A 26-item bibliography and appendices of related material are included.

875. Kliment, Stephen A. Getting the right light on the subject. AIA Journal, v61 n2 p44-46, Feb. 1974.

Lighting standards in educational facilities -- long an issue of dispute between architects and lighting engineers -- is more than ever in the limelight because of the energy crisis.

*876. Kolmes, Jo-Ann. Living and learning under cool-white. ATA Magazine, v60 n2 p55-58, Jan. 1980.

The effects of lighting on mood and behaviour are discussed. Some research results are presented.

**877. Kominsky, J.R. Health Hazard Evaluation Report, No. HETA-82-068-1111, Miamitown Grade School. Cincinnati, Ohio: Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health, May 1982. 7p. NIOSH-00130020.

The composition of a black, tar like thermal dielectric compound found in the Miamitown Grade School, Miamitown, Ohio was investigated. The school principal requested the study after expressing concern that the compound, which had leaked from several fluorescent lamp ballast casings, might contain polychlorinated biphenyls (PCBs). On December 7, 1981, a wipe sample was collected and analyzed. The surface of a luminaire where the ballast had previously burned out contained 3600 micrograms of PCB which was reported as Aroclor-1242. Other samples contained 0.9 and 0.6 micrograms of PCB per 100 square centimeters. The ballasts may have inadequate internal thermal protective mechanisms to prevent overheating and ultimate burnout, both of which are causes of leakage of the thermal dielectric compound. The author concludes that significant quantities of PCBs were released during ballast burnout. The author suggests that thermally unprotected ballasts be replaced with thermally protected units of Class-P classification.

878. Lehon, Lester H. Development of lighting standards for the visually impaired. Journal of Visual Impairment and Blindness, v74 n7 p249-53, Sept. 1980.

This article reviews the history of the development of lighting standards for the visually impaired. Available literature on how different levels of illumination affect visual acuity and visibility among persons with visual impairments is reviewed. Implications of this research for meeting the needs of visually impaired children in the classroom are discussed.

879. Lighting turns on learning. Modern Schools, p4-7, Nov. 1974.

Attempts to resolve the two factors instrumental in ineffectively lighted new classrooms: planning without taking newer design techniques into consideration and confusion regarding the lighting objectives in the classroom.

880. Lighting: an efficient sight plan. Modern Schools, p4-6, Oct. 1973.

Demonstrates the recommended reflectances in the classroom and suggestions are made for lighting maintenance and designing a new lighting system. Illustrated.

881. LPS lighting for school safety. Modern Schools, p3-4, Dec. 1977.

The second in a series of articles on low pressure sodium lighting concentrates on its use in schools for safety and security lighting.

*882. MacPherson, Colleen. Classroom lighting, color studied. Saskatchewan Bulletin, v53 n1 p3, Aug. 29, 1986.

This article discusses the findings of an Alberta study on how light and color affect the behavior, physiology and performance of elementary school children. The effects of ultraviolet light and carefully planned color schemes were particularly noted. A two year assessment of dental health done in conjunction with the behavioral study shows a reduction of dental caries in students exposed to trace amounts of ultraviolet radiation.

883. McGee, Charles T. "Health, Light, and the Electromagnetic Spectras" from How to Survive Modern Technology, Keats Publishing Inc., p108-116, 1979.

Studies by researchers such as John Ott show that electromagnetic radiation can have negative effects on both plant life and people. Human muscle strength is weakened under exposure to light that lacks part of the natural spectrum. Classroom experiments indicate that student performance, behaviour and hyperactivity improve when regular fluorescent lights are replaced with full spectrum fluorescent lights. Microwaves and X-rays have also been discovered to be health hazards.

*884. Mother's research finds lights affect learning. Reporter, v9 n1 p27, Oct. 1983.

The results of a number of studies show negative affects of fluorescent lighting in the school setting - including increase in disruptive behaviour, decrease in attention span, and higher incidence of headaches, nausea and irritability.

885. Myths and facts on low pressure sodium lighting. Modern Schools, p4-6, Nov. 1977.

This report attempts to clarify some of the myths and facts surrounding low pressure sodium lighting, which is recognized as a high intensity discharge light source.

**886. National Society for the Prevention of Blindness. Classroom Lighting. New York: National Society for the Prevention of Blindness, 1963. 15p. Available ERIC. ED 019 822.

The importance of illumination to the school child is discussed. Visual efficiency has a marked effect upon many learning situations and it is influenced by a number of factors -- (1) the stage of growth and development of the child's eyes, (2) the presence of eye defects, (3) relative brightness of object and background (contrast), (4) size of object, (5) distance of the object, (6) amount of illumination, and (7) glare. Also included are sections on -- (1) quantity of illumination, (2) quality of illumination and brightness balance, (3) reflection factors in the environment, (4) natural lighting and its control, (5) artificial lighting and its control, and (6) maintenance. In addition the role of the teacher in the illumination program is dealt with in terms of how he can improve the seeing conditions in the classroom.

*887. New school planning, teaching techniques mean greater flexibility for lighting needs. School Progress, v34 n12 p46-7, Dec. 1965.

Recommended illumination levels in minimum footcandles are presented in chart form for various tasks and locations throughout schools. Effect of lighting levels on heat, effect of promixity to windows on illumination levels and lighting requirements for audiovisual aids are also discussed.

888. New standards for classroom lighting. American School and University, v44 n7 p21-28, March 1972.

889. News and views on lighting, research and design. Nation's Schools, v93 n1 p48-52, Jan. 1974.

Contains four reports on the latest developments in lighting, research and design, and a 10-item annotated energy bibliography.

890. Nicholls, M.K. and M.R. Potter. Effects of full spectrum fluorescent lighting on the growth rates of children in four first schools in Bradford. Journal of Environmental Science and Health. Part A, Environmental Science and Engineering, vA20 n2 p121-134, 1985.

A comparison was made between the weight and height increases of first school children illuminated under either 'full-spectrum' or 'cold white' fluorescent tubes. 80 children distributed between four schools were observed during 1980/81 and the experiment was repeated the following year using a similar number of children. Although significant differences in height and weight gains were found between schools no differences attributable to either sex of children or lighting treatment were detected. The results of these experiments are discussed in terms of the findings and experimental design of previous workers.

**891. Ontario. Ministry of Education. Lighting for Education. Toronto: Ontario. Ministry of Education, Ministry of Colleges and Universities, 1981. 42p. Available ERIC. ED 217 515.

Some of the qualities and quantities that must be juggled to produce good lighting for educational facilities are analyzed with photographs, tables, and drawings. The three categories of lamps used for school lighting (incandescent, fluorescent, and high intensity discharge) are described, a lamp selection guide gives the design characteristics of lamps in each category. The effectiveness of windows, the advantages and disadvantages of windowless schools, and screening devices for controlling glare and sunlight are discussed along with aspects of daylighting design for new schools. Scientific findings applicable to light in schools are summarized. Considerations met by the provision of manual switching, time, photoelectric, and other light controls are described. Guidelines are offered for appraising an existing lighting system. Related improvement procedures are categorized as those that require no capital investment, those with a short pay-back period, and those with a long pay-back period. Exterior lighting and forecasts of lighting in the year 2000 are included. A glossary is provided and the appendices contain drawings and descriptions of the principal lamp types used, as well as two statements from official sources concerning the effects of ultraviolet radiation.

892. Ott, John N. Health and Light. New York: Simon & Schuster, 1973.

In 1973 a study was conducted by the Environmental Health and Light Research Institute in Sarasota Florida, showing dramatic reactions in hyperactive children. In two first-grade classrooms, the standard cool white fluorescent tubes and fixtures with solid plastic diffusers remained unchanged. The plastic diffusers stopped the transmission of any trace of long-wavelength ultraviolet. In two other classrooms, the tubes were replaced with full-spectrum fluorescent tubes that more closely duplicated natural daylight. By means of hidden time-lapse cameras, student behaviour was observed and recorded. Under the standard cool white lighting, some children demonstrated nervous fatigue, irritability, lapses of attention, and hyperactive behaviour. Within a week of the new lights being installed, a marked improvement in their behaviour appeared and overall classroom performance improved. Experiments are also referred to in which the effect of light and darkness on the pineal gland has been studied, as well as studies concerning low-frequency non-ionizing radiation, hyperactivity and learning disabilities. A connection is also suggested between the hyperactive reaction to radiation from unshielded fluorescent tubes and the same symptoms triggered by artifical food flavours and colourings.

893. Ott, John N., and Lewis W. Mayron. Influence of fluorescent lights on hyperactivity and learning disabilities. Journal of Learning Disabilities, v9 n7 p417-22, Aug/Sept. 1976.

This study describes in detail the study of the Environmental Health and Light Institute, in which four regular elementary windowless classrooms, two with standard type fluorescent cool-white tubes and two with full spectrum, radiation-shielded fluorescent fixtures, were compared for their effects on hyperactive behaviour. Time-lapse photography was used to produce a permanent record of the children's actions. The study concluded that cool-white unshielded fluorescent lights could contribute to hyperactive behaviour.

894. Painter, Marylyn. Fluorescent lights and hyperactivity in children: an experiment. Academic Therapy, v12 n2 p181-4, Winter 1976/77.

**895. Pancoast, Ferendino, Grafton and Skeels, Architects. A Study of Emergency Lighting for the Dade County Board of Public Instruction. Miami, Fla.: Pancoast, Ferendino, Grafton and Skeels, Architects, July 1964. 20p. Available ERIC. ED 028 627.

Immediate installation of emergency lighting, in addition to that already provided, is recommended for three groups of existing schools -- (1) air-conditioned schools and additions with compact plans having inside corridors and instructional areas artifically lighted, (2) senior high schools with adult education programs, and (3) community schools offering instructional programs to all age levels and using elementary, junior and senior high school plants. The need for additional provisions is based on the danger of panic in crowds when power fails due to causes outside of the building such as hurricanes, local storms, seasonal overloads, or national emergencies. Recommendations are given for providing emergency lighting systems independent of public utility service.

896. Papadatos, S.P. School interiors and their psychological effects upon students. School Board, p21-23, Winter 1972.

The author, an architect, points out that research has shown that colours have profound psychological effects on employees in industry. Increased production, reduced absenteeism and improved morale are some effects which have been noted. The school environment could be improved for students and teachers by more effective use of colour and lighting. Some specific suggestions are provided.

**897. Rankin, John C. Lighting for Our Schools. Paper presented at the 59th Annual Meeting of the Council of Educational Facility Planners, International, Columbus, OH, September 26-29, 1982. 39p. Available ERIC. ED 225 287.

In this speech, the author traces the history of lighting in schools, discusses the variables affecting the amount of illuminance needed, and provides a table of illuminances recommended for Ontario schools. Other factors that affect vision -- glare, veiling reflection, color, and brightness balance -- are outlined. Planners are admonished to recognize the needs of visually handicapped students when planning school lighting. Following this is an explanation of the characteristics and uses of the three categories of lamps used in school lighting: incandescent; fluorescent; and high intensity discharge with its mercury, metal halide, and high and low pressure sodium types. The author then deals with windows and daylight, how to control sunlight, and designing for new schools. The relation between light and health and lighting for plant growth are briefly discussed. In closing, practices are listed to make the most of existing systems.

**898. Reida, George W., and others. Artifical Lighting for Modern Schools, A Guide for Administrative Use. Topeka: Kansas State Department of Public Instruction, 1960. 50p. Available ERIC. ED 014 194.

The development of good visual environment and economically feasible lighting installations in schools is discussed in this guide. Eighty percent of all school learning is gained through the eyes as estimated by the U.S. Office of Education. Good school lighting is comfortable, glarefree and adequate for the visual task. Eye strain and unnecessary fatigue as a result of poor visual conditions affect learning. Satisfactory lighting is more than providing recommended levels where they are needed. Consideration must also be given to the quality of light providing adequate and comfortable seeing conditions for every type of school activity. Four factors that affect vision are -- (1) size, (2) contrast, (3) time, and (4) brightness. Other topics discussed are -- (1) the visual environment, (2) trends in natural lighting, (3) light and interior finishes of ceilings, walls, floors, chalkboards, trim and furniture, (4) brightness differences, (5) principles of schools lighting, (6) brightness, (7) levels of illumination, (8) selecting lighting fixtures, and (9) lighting costs, switches, outlets, maintenance and surveys. It is highly recommended that school boards and administrators seek the assistance and services of trained and registered architects or lighting engineers to design and plan any major school relighting program.

899. Relighting: The bright gift for the glum room. Modern Schools, p4-7, Dec. 1974.

Relighting classrooms with peripheral lighting fixture layouts increases the room's illumination level, reduces glare, and increases the uniformity of desktop illumination.

900. Ruud, Alan. What to look for in classroom lighting. American School and University, v51 n1 p45-8, Sept. 1978.

Considerations for a classroom lighting system include the quality of the system in terms of improved seeability, operating efficiency, and energy savings.

**901. Sampson, Foster K. Contrast Rendition in School Lighting. New York, N.Y.: Educational Facilities Labs., Inc., Jan 1970. 103p. Available ERIC. ED 037 943.

Eighteen significantly different classroom lighting systems were measured and analyzed in order to determine how contrasts from different light sources affect the ability to see visual tasks in the school room. Using criteria and techniques established from previous lighting research, the lighting systems are evaluated according to their characteristics regarding contrast rendition of pencil handwriting. The comparisons and conclusions presented should be helpful in selecting classroom lighting systems.

**902. Schulz, Joan. Lighting and the learning space. OSSC Bulletin, v21 n2. Eugene: Oregon School Study Council, Oct. 1977. 43p. Available ERIC. ED 144 255.

Poor lighting conditions in classrooms result not only from low intensity light but also from too high intensity light, an uneven distribution of light, and glare. Since visual tasks in a classroom constitute 62 percent of a student's time in school, suggestions are made of ways lighting conditions can be improved. The principles and characteristics of different types of illumination -- incandescent, fluorescent, mercury vapor lights, and metal halide lamps -- are explained. Techniques for the measurement of illumination, brightness or intensity, reflection and glare, and light distribution are outlined. A brief explanation is given of print types, line widths, leading, colored inks, and colored papers as they relate to the speed of reading.

**903. State University Construction Fund. Performance Criteria for the Luminous Environment. Interim Report. Albany, N.Y.: State University Construction Fund, Jan 1968. 23p. Available ERIC. ED 035 222.

This interim report informs the eventual user of the direction of the long-term program; specific criteria are not provided. Five current guidelines in lighting practice were disavowed as follows--(1) that low levels of illumination cause organic harm to the eyes, (2) that the footcandle is the best criterion for determining the proper illumination of a space, (3) that increasing the level of light intensity is the only way to improve visual performance, (4) that rooms with uniform task distribution require uniform lighting, and (5) that uniform lighting is desirable even in rooms with non-uniform task distribution. Plans for follow-up studies and the final report form were discussed. Appendix I lists conference participants. Appendix II presents a design checklist guided by an overall building concept.

904. Sydoriak, Diane. Light and color research continues in Arkansas. CEFP Journal, v22 n1 p16, Jan-Feb. 1984.

Describes a research project that will measure whether student achievement, blood pressure, height, and weight gain are influenced by the choice of color and/or the source of artificial light in the classroom. Four third-grade classrooms will be the treatment groups involving two colors and three different artificial light sources.

905. Treichel-Arehart, Joan. School lights and problem pupils. Science News, v105 n16 p258-259, April 1974.

Pilot project results indicate that under certain conditions, fluorescent lighting may cause or aggravate hyperactivity in school children. Drawing on observations made in photobiological research, a new type of lighting was developed. Teachers in two experimental classrooms reported improvement in hyperactive pupils, which was also verified by time lapse photography.

*906. Try coloring your classroom. Reporter, v8 n3 p54, Dec. 1982.

This article discusses the results of a study by Professor H. Wohlfarth on the physiological effects of color and lighting on a group of handicapped children. In the experiment he found that light had the identical impact on the blood pressure, pulse and respiration rates of two blind children as on seven students with normal sight. Other studies on the effects of light and color on human behaviour are also briefly discussed.

*907. Vandenhazel, B.J. Can we really justify the windowless school. Ontario Education, v3 p8-10, May-June, 1971.

The author conducted a thorough study of windowless school design. International literature was searched in the areas of educational philosophy, economic justifications for windowless classrooms, fire hazards, functions of light in man, the physiological clock in mammals, sensory deprivation, the development of the human eye, the interaction of man and his environment and the ecological and economic consequences of excessive energy consumption by year round air conditioning.

On the strength of this research and visits to 150 schools, the author concludes that windowless, year round air conditioned buildings cannot be justified from either an ecological or a long term economic viewpoint. Specific recommendations are made to make conditions more tolerable in existing facilities.

**908. Wisconsin University. The Luminous Environment for Education. A Selected Bibliography. Madison: Wisconsin Univ., ERIC Clearinghouse on Educational Facilities, May 1970. 49p. Available ERIC. ED 037 993.

This compilation is a survey of the literature pertinent to the design of lighting for educational facilities. The contents are selected to be an overview of the topic while maintaining a technical level comprehensible to the layman concerned with school planning and design. The general subject areas are -- (1) the visual and lighted environment as it relates to educational facilities, (2) man's biological, psychological and physiological needs for light in the school environment, (3) the electrically lighted physical environment for educational facilities, (4) the lighting of audio-video facilities and auditoriums, (5) the provision of daylight for the school environment, and (6) applications of lighting design to educational facilities.

*909. Wohlfarth, Professor H. Color and Light Effects on Students' Achievement, Behaviour and Physiology. Edmonton: Alberta Education, 1986. 182p.

A quasi-experimental non-equivalent control group design was used to investigate the effects of full-spectrum light, prescribed color and light/color combinations, ultra-violet light and electromagnetic radiation in an elementary school environment. The independent variables were exposure to full-spectrum light or prescribed cool colors for teachers and prescribed warm colors for students or a combination of light and color treatments, ultraviolet light for a sample of grade five students and elimination of electromagnetic radiation for a sample of grade three students. Dependent variables were primarily student academic, physiological and affective outcomes and also included blood pressure as a teacher physiological measure. A pre-experimental static-group comparison design was used in the investigation of mood and noise. No consistent significant cause-effect relationship was found between the independent variables and students' ability or academic levels, attitudes toward school subjects, misbehaviours warranting disciplinary action, absences due to illness, refractive eye problems or blood pressure. Sporadic significant cause-effect relationships for student blood pressure were obtained and color affected consistent, though non-significant increases in a.m. to p.m. blood pressure suggesting the stimulating yellows in the classrooms may have some short term effect on students. No relationship was evident for teacher's blood pressure. Significant relationships were obtained between the independent variables of color/light and student pre adolescent mood variations and noise levels. In addition, a causal effect was demonstrated for supplemental levels of ultraviolet light and reduced incidence of dental caries and absences due to illness of grade five students. Furthermore, off task behaviours of hetergeneously grouped grade three students were significantly reduced when electromagnetic radiation associated with fluorescent lighting was eliminated. No effect was obtained for pupils selected for high levels of hyperactivity.

*910. Wohlfarth, H., and Cathie Sam. *The Effect of Colour Psychodynamic Environment on the Psychophysiological and Behavioural Reactions of Severely Handicapped Children*. Edmonton: Alberta Education, Planning and Research, 1981. 57p.

This study set out to measure the impact of a colour and lighting change behaviourally and physiologically on severely handicapped children in their school setting. The results indicated a measurable and significant effect of the environmental intervention. Of the behaviours considered, aggressive behaviour appeared to be the most changed. It was also observed that blind subjects were as affected as sighted subjects.

911. Wotton, Ernest. *Lighting for Education*, Toronto: Ontario Ministry of Education, 1981. 39p.

This booklet considers some of the qualities and quantities that must be dealt with to produce good lighting for education. Such things as distracting hum from fluorescent light ballasts is dealt with. Fluorescent lighting's possible effect on hyperactive children is discounted due to lack of conclusive data. It is suggested that students working under fluorescent lighting with very good colour rendering become less visually fatigued than those working under some other forms of fluorescent lighting.

912. Wurtman, Richard J. Biological implications of artificial illumination. *Illuminating Engineering*, v63 n10 p523-529, Oct. 1968. ED 025 925. Not Available ERIC.

Environmental lighting exerts profound biologic effects on humans and other mammals, in addition to providing the visual stimulus. Light acts on the skin to stimulate the synthesis of Vitamin D. It also acts, through the eyes, to control several glands and many metabolic processes. Light, or its absence, "induces" certain biologic functions. Light also serves as the dominant timer, or synchronizer, for biologic rhythms which result from oscillations that originate within the body. Hence alterations in environmental lighting can produce marked, and sometimes pathologic changes in metabolism. Little is known about the action spectra for the endocrine effects of light, or even about the identity of the retinal photoreceptors which mediate these effects. Light acts by generating (or inhibiting) nerve impulses, which travel along specific pathways in the brain to centers concerned with the control of endocrine function. As information accumulates about the mechanisms of the biologic effects of light, sources should be modified to become compatible with biologic needs. Pending the accumulation of such information, it appears reasonable to encourage the illuminating engineer to consider using natural light (or spectral facsimiles) in modern artificial environments.

913. Ziff, Stephen J. Better safe than sorry. School Management, v17 n7 p40-41, Aug-Sept. 1973.

Describes the increased need for emergency lighting equipment for late evening events, adult education evening classes, and for the increasing use of the interior classroom. Explains the difference between central and unit lighting systems; clarifies the specifications in the Occupational Safety and Health Act (OSHA) as they apply to school lighting codes; provides a case study; and answers often-asked questions concerning emergency lighting.

BIBLIOGRAPHIES IN EDUCATION SERIES

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